Marine Review

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The National Publication Covering the Business of Transportation by Water

June, 1927

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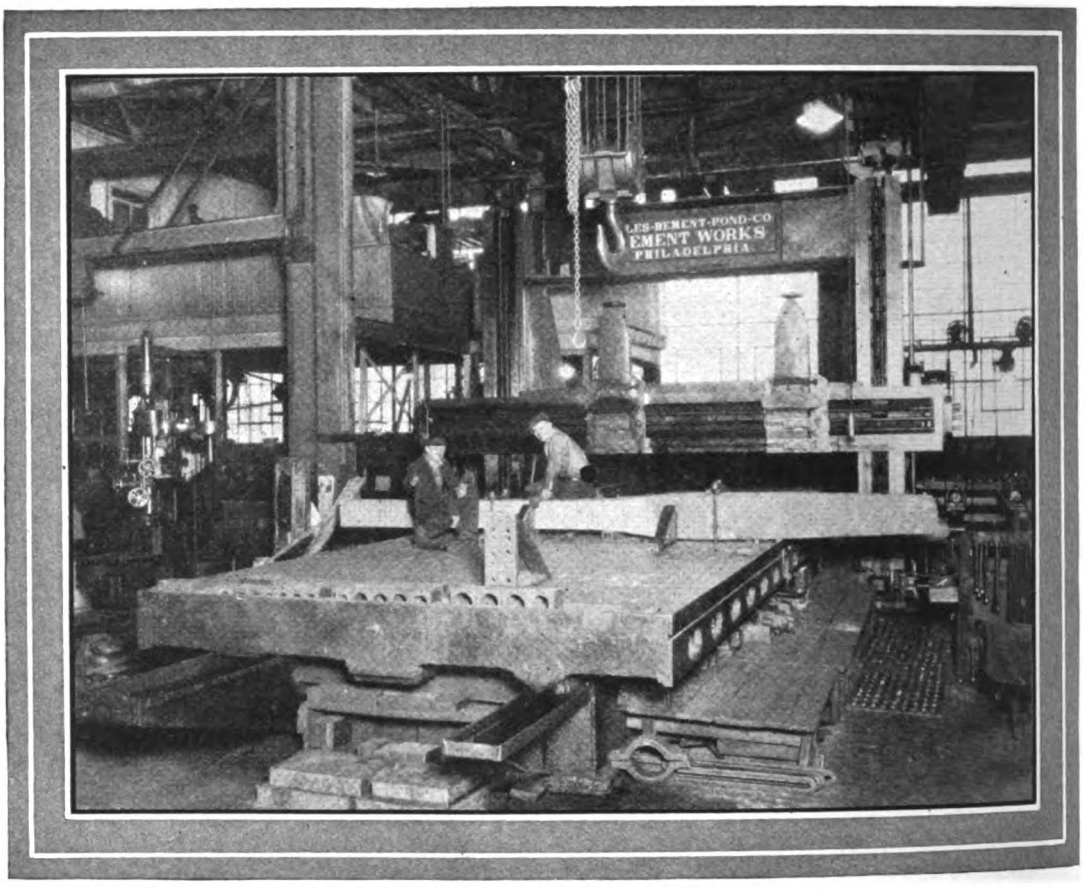

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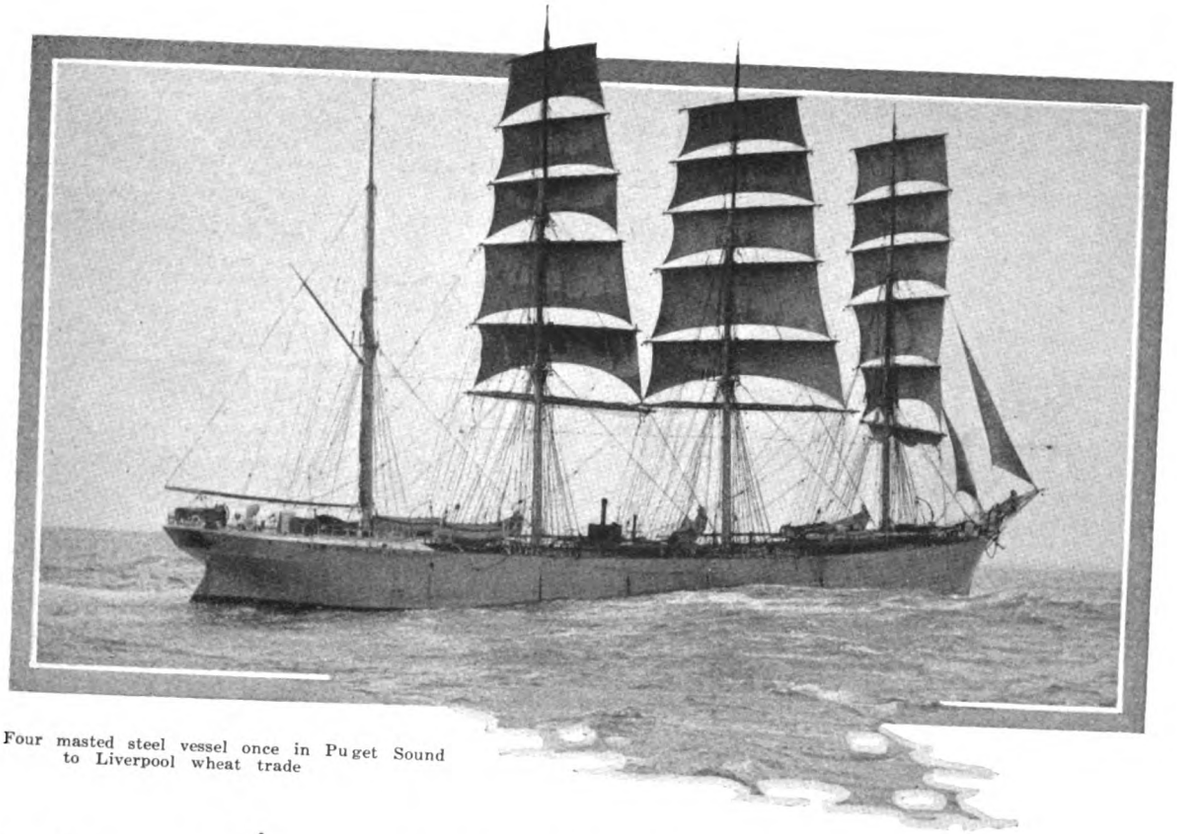


Four masted steel vessel once in Puget Sound to Liverpool wheat trade

Make Use of Sail Power Aided by Auxiliary Motors

ASIDE from the matter of sentiment, as a purely business proposition, it has been seriously suggested in a most interesting paper presented before the spring meeting of the Institution of Naval Architects that steps be taken to secure the renaissance of the sailing ship.

The average owner shows little interest in the possibility of the sailing ship with auxiliary power since he cannot figure out its economic superiority over the cheap cargo ship. But this apparent inferiority, it is pointed out may not exist if consideration is given to the many factors of improved design now possibly due to greater knowledge of aerodynamics, the use of modern mechanical appliances for reduction of labor, and making a proper balance between sailing qualities and cargo carrying capacity. Also for best results the sailing ship should be used in special trades on definite routes.

A Bremen shipping firm, having in mind the steadily increasing prices of fuel which may ultimately make the operating expense of engine driven vessels prohibitive, has lately ordered several cargo sailing ships of 5000 to 6000 tons deadweight fitted with auxiliary motors. Two other notable examples, the Danish five masted training ship KOBENHAVN with auxiliary motors and the Japanese four masted training ship SHINTAKU MARU also fitted with auxiliary power, indicate the existence of a feeling that there is an important field of service for this type of vessel.

The author of this paper, in order to investigate the possibilities of increase in speed of large sailing ships, compares the resistance of a proposed design of a four masted barque with three typical clipper ships and with one large modern steel sailing ship. The best reported day's run of Australian emigrant sailing ships was 432 miles or 18 miles per hour. The same wind under similar conditions would give the sailing ship POLA (four masted barque built in Hamburg in 1916) a speed of 16½ to 16¾ knots while the proposed vessel would under the same circumstances reach a speed of 20¼ to 20½ knots.

The tea clippers averaged 13 knots in a day's run in a breeze. Under similar conditions the POLA'S speed would be 12 to 12½ knots while the proposed barque would make 13½ to 14 knots. These figures are given to show the speed possible from sailing ships if their design had followed more closely the lines of the early

clipper ships when steel came into use and hulls could be built longer.

Following up the ideas outlined above the author suggests that fitting a diesel engine or preferably diesel-electric drive of moderate power to these easy driven ships will add *regularity* to their speed. In the design prepared the power necessary to give a speed of 8½ knots in fine weather is 450 shaft horsepower, and full engine power will be used only when the speed under sail alone is 10 knots or less. On runs from England to Australia on the basis of the logs of several clippers the full engine power would be used for about one-half of the passage time while during the other half an average of only one-fifth of the total power is needed. The mean engine power during the whole voyage would thus be 270 shaft horsepower which amounts to 1½ tons of fuel per day for propulsive engine power at an approximate cost of $29.10.

On the proposed vessel electrical power would be available for working sails, weighing anchor, loading or unloading, pumping and trimming the ship, refrigeration, heating, ventilating, distilling and coking purposes. The technical improvements which are now so widely used in other types of ships should be applied to the many details in ship and rigging so that a motor sailing ship of this type could be worked with a comparatively small crew. Before returning from a southern voyage necessary drydocking expense could be saved and still the bottom of the ship could be cleaned by having a suitable pumping arrangement and by the use of wing ballast tanks, by heeling the ship when light over 50 degrees which would bring the greater part of the bottom above the water. The propeller and rudder could also be inspected and necessary repairs be effected without the expense of docking the ship.

For the particular ship proposed the carrying of passengers would be an important feature. Plans worked out show that it is possible, in a ship of dimensions suitable for good sailing qualities and handiness and which satisfied all the above conditions, to arrange spacious and well ventilated accommodations for the most exacting first-class traveller, at the same time allowing clear room on deck for working the sails and as a promenade for passengers. Fifty separate and roomy outside cabins for first-class passengers are provided for in the design. Each cabin is intended for one person but can be arranged for two when desired. The ship's company of officers, doctor, seamen, engineers, cooks, stewards and apprentices amounts to 58, twenty-five of whom are apprentices. The deadweight to the subdivision load line (freeboard to margin line 8 feet) is about 1500 tons.

To put into such a ship new ideas in design of hull, machinery, rigging, equipment and in pumping and flooding arrangements will be expensive. The outfitting and upkeep must be of the customary high quality associated with a first-class passenger steamer in order to attract the proper class of travellers. Though the first cost and working expense will be high it is probable that ships of this type would become popular on account of their speed performances and that no difficulty would be experienced in obtaining profitable passenger rates.

The author does not suggest that such ships will be numerous but that the primary reason for their construction would be to realize in practice what sailing qualities and improvements are possible at the present time and thereby open away for the most suitable commercial motor sailing ship. However, a vessel as proposed would, while paying her own way, also fulfill the mission of a splendid training ship and would help to revive the interest in ocean racing of the clipper ship era.

An approximate financial estimate for a motor sailing ship as outlined has been made by the author. The period taken is one year. Six voyages are assumed as completed within this period; first voyage, Plymouth, Eng., to Melbourne, 55 days at sea; second voyage, Melbourne via Rio de Janerio, Azores Islands to Plymouth, 70 days at sea, 14 days in harbor; third voyage, Plymouth to New York, 25 days at sea; fourth voyage, New York to Plymouth, 18 days at sea; fifth voyage, Plymouth, sailing in Scandinavian waters and back to Plymouth, 25 days at sea and 11 days in port; sixth voyage, Plymouth sailing in the Mediterranean and back to Plymouth, 25 days at sea, 11 days in harbor. On the basis of this itinerary the estimated operating expenses and receipts for a year are as follows:

Estimated Operating Expenses Per Year

1. Diesel motor oil. At sea 218 days @ 2 tons a day equals 436 tons @ $19.40	$8,458.40	
In harbor 147 days @ ½ ton a day equals 73½ tons @ $19.40	1,425.90	
		$ 9,884.30
2. Lubricating oil for 365 days, $2.74 per day (average)	$ 1,333.75	
3. Provisions for the crew (58 men) 365 days, and 65 passengers 254 days		43,650.00
4. Wages of crew		38,800.00
5. Repairs and renewals		24,250.00
6. Tonnage dues: pilotage, harbor expenses		14,550.00
Operating expenses, total		$132,468.05
7. Management, advertising, etc.		16,975.00
8. Insurance and depreciation		48,500.00
Total expenses		$197,943.05

Estimated Receipts Per Year

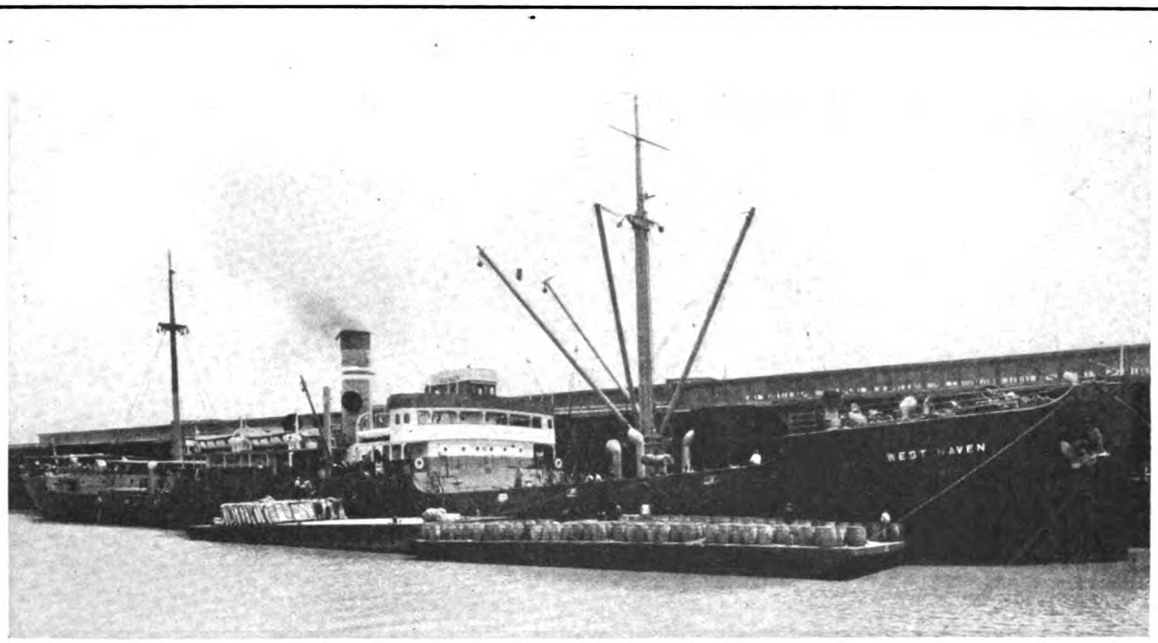
Trip 1—35	passenger in single cabins @	$727.50	$ 25,462.50
30	passengers in double cabins @	654.75	19,642.50
600	tons of general cargo		4,365.00
Trip 2—35	passengers in single cabins @	945.75	33,101.25
30	passengers in double cabins @	848.75	25,462.50
600	tons of general cargo		4,365.00
Trip 3—35	passengers in single cabins @	218.25	7,638.75
30	passengers in double cabins @	194.00	5,820.00
400	tons of general cargo		1,455.00
Trip 4—35	passenger in single cabins @	218.25	7,638.75
30	passengers in double cabins @	194.00	5,820.00
600	tons of general cargo		2,425.00
Trip 5—35	passengers in single cabins @	557.75	19,521.25
30	passengers in double cabins @	509.25	15,277.50
Trip 6—35	passengers in single cabins @	557.75	19,521.25
30	passengers in double cabins @	509.25	15,277.50
Restaurant	and catering profit		7,275.00
Receipts, total			$220,068.75

The author in conclusion expresses the hope that the opinions advocated will revive to some extent interest in the motor sailing ship since this type of ship is at the beginning of its possible structural, aerodynamic, and engine improvement, that wireless telegraphy in connection with modern meteorology is likely to insure fast and regular passages, that much valuable data for securing better designs for economical propulsion can now be acquired in experimental tank investigations, and because we are rapidly losing our skill in designing and handling sailing vessels—skill that was the result of hundreds of years of experience and that always demanded the highest ability of naval architects and sailors.

The Hamburg American line is to name its new steamer BOSTON, and will add her to the service between Hamburg and Boston.

The shipping board on May 3 decided to make no change in the present operation of the American Merchant lines. This action followed hearings held on a proposal to consolidate the five passenger-cargo ships of the lines with the United States lines and to assign the Southgate Marine Corp. of Norfolk, Va., as operators for the five cargo vessels now operated in conjunction with the others by J. H. Winchester & Co. Inc.

Taken from a paper, by Capt. Chr. Blom, read at the spring meeting of the sixty-eighth session of the Institution of Naval Architects at London, April 7, 1927. The author is a member.



S. S. WEST HAVEN *at Savannah, Ga., May, 1927*

Superheat Improves Operation

Compare Performance of S. S. West Haven With and Without Superheat—Better Economy Due to Superheat Saves $7600 a Year

BY FRANK PAGE

THE obscurity which enshrouds most of the results obtained in the operation of marine power plants is due to the lack of similarity between them in operating conditions, or to the lack of sufficiently detailed data having a bearing on the test, and covering all of its conditions. Many able engineers have thus found themselves in serious doubt as to the confidence which they could properly place in the claims made, and to reconcile the test results with those probably obtainable in year-round service.

A good deal of controversy has taken place in recent months as a result of reports published covering the operations of various steamers. In many cases the names of the steamers were not given, nor was there any way in which a student of steam engineering could identify the source of the information or check it up. There is a natural tendency on the part of many readers to accept published statements as facts, and it seems, therefore, particularly important that the results of steamship operation should be emphasized whenever they are sufficiently complete and accurate so that they constitute an unimpeachable record for the guidance of marine engineers and operators.

The S. S. WEST HAVEN, built by Skinner and Eddy at Seattle is an 8800-ton, well deck cargo steamer, fitted with three single ended scotch marine boilers, and propelled by a 2500 indicated horsepower triple expansion steam engine. She is owned by the United States shipping board, and the records of her operation have been established under the accurate system of the fuel conservation committee. This is undoubtedly the most comprehensive and carefully applied method of obtaining accurate data of performance of any in use with a merchant marine fleet of equal size. The story of the WEST HAVEN'S performance is briefly outlined below.

During many months of steaming between the United States and European ports, difficulty was experienced with rings in the high pressure cylinder, and the impression that the trouble arose from the use of superheat gradually became a conviction. The superheaters were designed for 60 degrees of superheat, and it was frequently necessary to use two sets of high pressure piston rings in one crossing of the Atlantic.

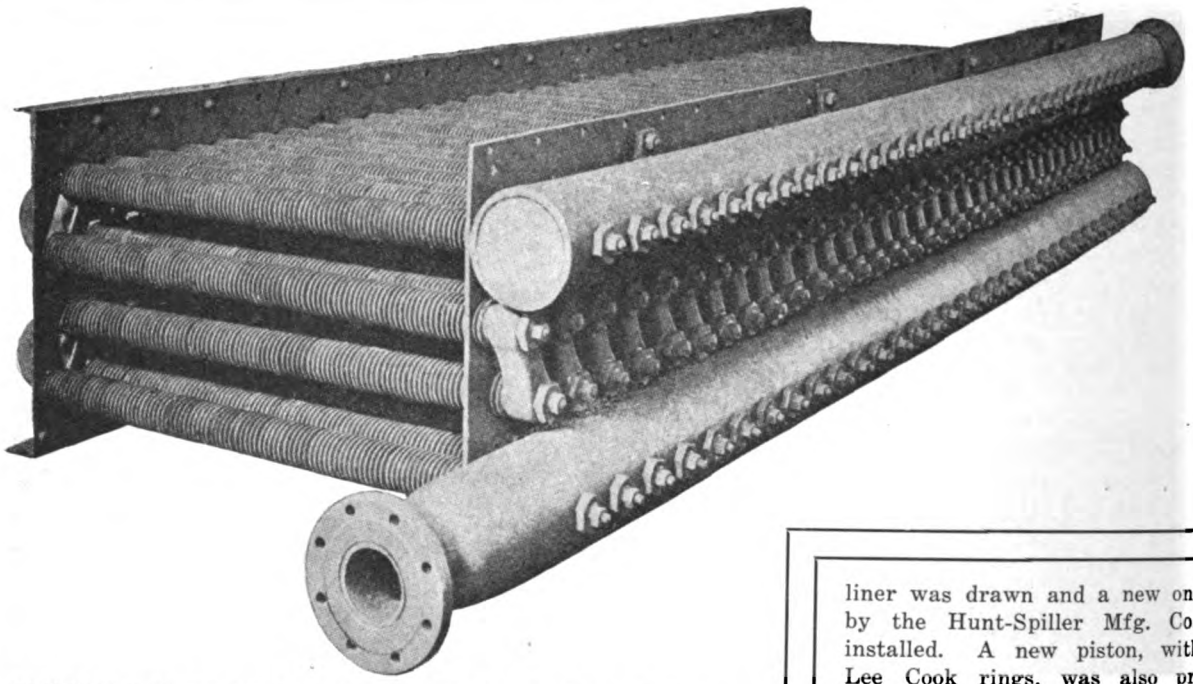
The WEST HAVEN is one of many sister ships owned by the United

Superheat & Efficiency

According to operating data obtained by the fuel conservation section of the shipping board two facts as related in this article are definitely determined for the S. S. West Haven, a 2500 indicated horsepower triple expansion reciprocating engined and scotch boilered cargo ship of 8800 deadweight tons.

First, that superheat of 50 to 60 degrees Fahr. was not responsible for piston ring trouble. Second, that an appreciable saving in fuel consumption was due to this superheat.

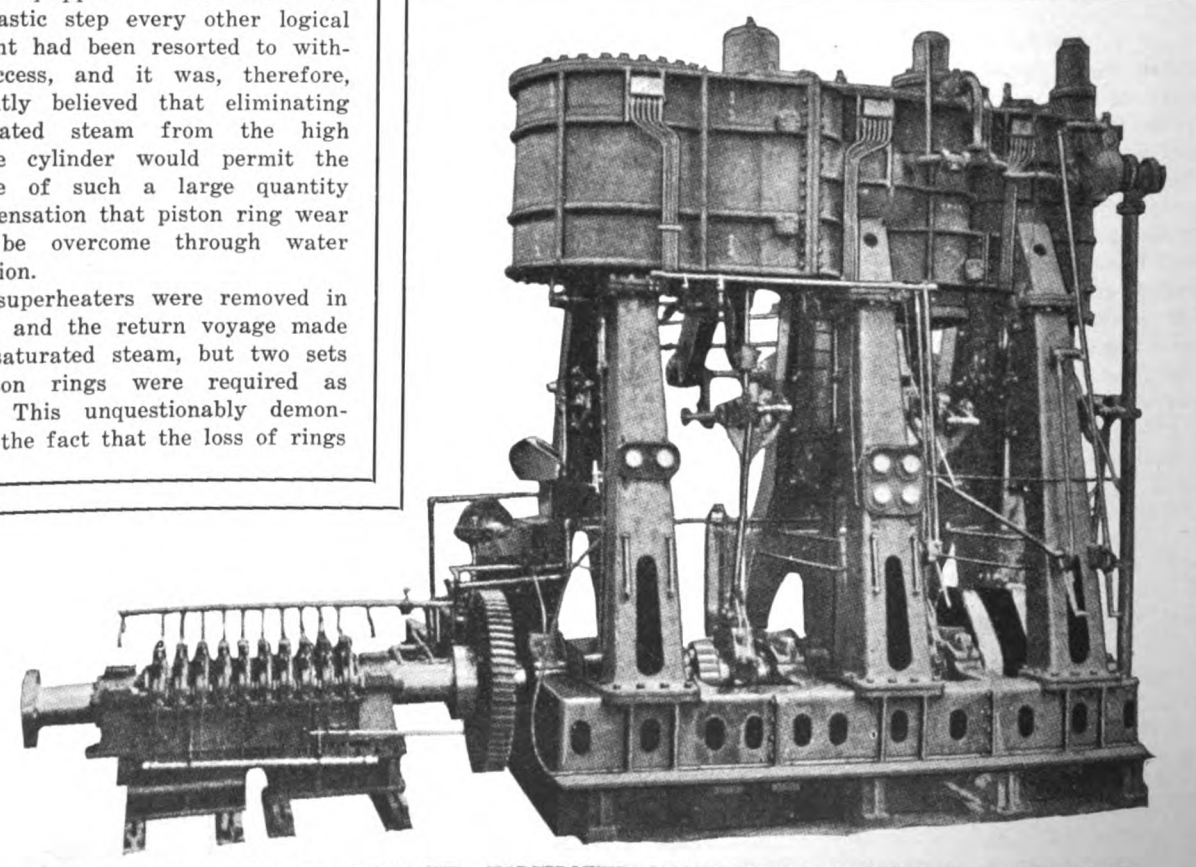
To progress steadily toward the ideal of highest efficiency in marine engineering it is essential that all the facts surrounding the practical performance of any device intended to reduce the cost of operation be accurately determined. Jumping to conclusions and blind prejudice are characteristics foreign to the real engineer; proven facts alone should influence his judgment.



FOSTER WASTE HEAT TYPE SUPERHEATER IN S. S. WEST HAVEN

States shipping board, and the continued replacement of piston rings caused orders to be issued for the removal of the three waste heat type superheaters with which her boilers were equipped. Previous to this drastic step every other logical expedient had been resorted to without success, and it was, therefore, confidently believed that eliminating superheated steam from the high pressure cylinder would permit the presence of such a large quantity of condensation that piston ring wear would be overcome through water lubrication.

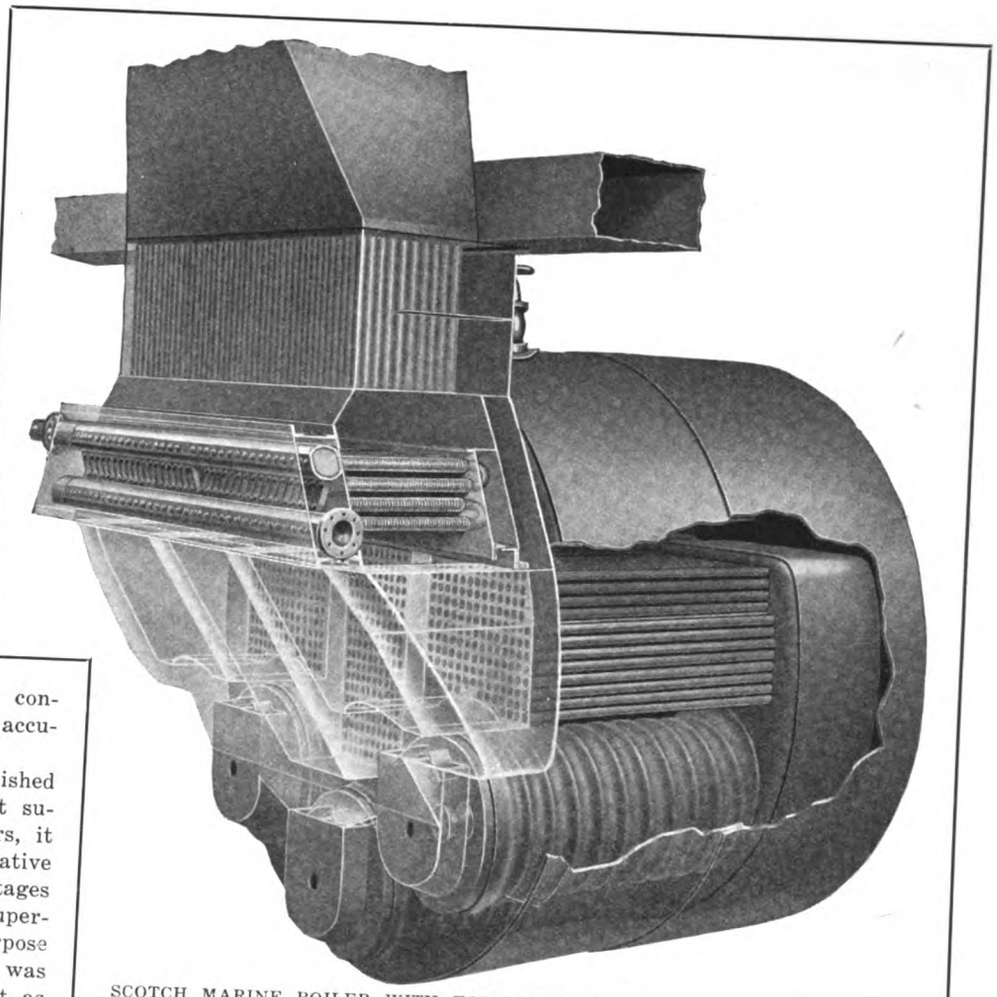
The superheaters were removed in Europe, and the return voyage made under saturated steam, but two sets of piston rings were required as usual. This unquestionably demonstrated the fact that the loss of rings was not caused by superheat, and prompted a thorough investigation of other conditions. The high pressure liner was drawn and a new one, cast by the Hunt-Spiller Mfg. Co., was installed. A new piston, with new Lee Cook rings, was also provided and since then the engine operation has been faultless so far as the high pressure cylinder is concerned. Thus, it was established that the specific trouble resulted from the use of defective parts produced in the war time emergency and was not a function of the steam temperature.



TRIPLE EXPANSION 2500 INDICATED HORSEPOWER MARINE STEAM ENGINE IN S. S. WEST HAVEN

Steamers of the same class as the West Haven had been showing a lower fuel consumption, however, and for that reason it was decided to try reinstalling the waste heat superheaters. This was done, and the vessel equipped with her original superheater complement in April, 1925, resumed her regular sailing schedule.

The voyages subsequent to the installation of superheaters were entirely successful. No further difficulty was experienced with rings for pistons, and the fuel consumption was reduced to a point where it compared favorably with any of the similar ships. The attention which she had attracted, due to study of difficult conditions had provided the operators with fuel consumption figures of the utmost accuracy.



SCOTCH MARINE BOILER WITH FOSTER WASTE HEAT SUPERHEATER AND AIR HEATER

In addition to the proof, established by the foregoing experience, that superheat did not cause the repairs, it was desired to show by comparative figures precisely what the advantages produced through the use of superheat amounted to. For this purpose a detailed study and comparison was made of the voyages on superheat as well as on saturated steam, in order to find two which could be directly compared. The two trips mentioned below are remarkably close so far as operating conditions are concerned; that is, the draft of the ship, propeller slip and average speed. Both voyages were via Baltimore, Norfolk, Rotterdam and Antwerp. The vessel was handled by the same operators; even the same chief engineer being continuously in charge. It is particularly important to note that the voyage on saturated steam chosen for comparison was that upon which the WEST HAVEN made the best saturated steam record. Thus, there is no doubt that the comparison is conservative.

Performance of S. S. West Haven With and Without Superheat

	Date	Average speed	Average slip	Average draft	Lbs. fuel per mile	Fuel per 24 hours barrels At sea	Fuel per 24 hours barrels In port
Without superheat	5/16/24 7/4/24	10.34	11.6	16'9"	290	213.5	41.9
With 56° F. superheat	5/30/25 7/17/25	10.57	9.5	16'7"	263	198.4	37.3

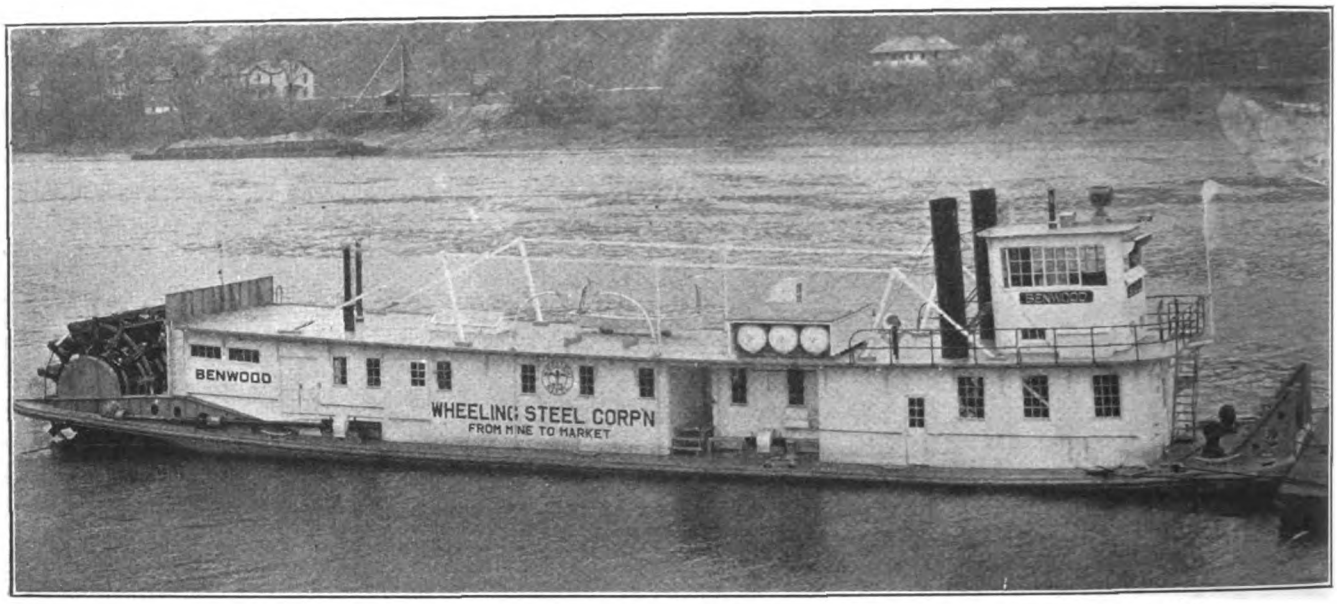
The actual fuel oil saving in pounds per mile covered was 27 pounds, and the saving per day at sea amounted to 15 barrels. The saving per day in port was 4.6 barrels of oil, thus fully justifying the installation of superheaters on a basis of return from the money invested.

Using a cost of $1.715 per barrel of oil, the actual mileage at sea of 45,457 miles for the year, and hours in port of 684, actual per trip given, the saving in fuel amounts to about $7600 per year. This allows ten days out of service for drydocking and painting. Thus the figures represent regular operating totals, they are not the opinion or investigation of only one man, they are not peculiar to some special steamer and they are not abnormal. They check up logically with the operation of many sister ships from the same drawings, and the same shipbuilder; they were procured by a government bureau specializing in this work and having more time for such study, more ships under observation and a larger competent personnel than has ever been engaged in a similar marine investigation.

Two years of satisfactory operation have elapsed since the superheaters were reinstalled, and it is thus proper to state that superheat was in no way responsible for the piston ring trouble in the first place. This information is felt to be of a sufficient definite character to warrant careful study by students of marine engineering, especially those interested in reciprocating steam engines, because there are relatively few demonstrations as conclusive as this one, and where the figures were obtained by such able and unbiased authority.

The percentage of saving due to the use of 56 degrees of superheat amounts to 9.3 per cent on the basis of fuel consumed per mile. This is in no way an abnormal or unusual saving where operating conditions were not of the best when saturated

(*Continued on Page* 50)



Sternwheel diesel towboat BENWOOD recently completed by the Dravo Contracting Co. for the Wheeling Steel Corp.

Improve River Towboat Design

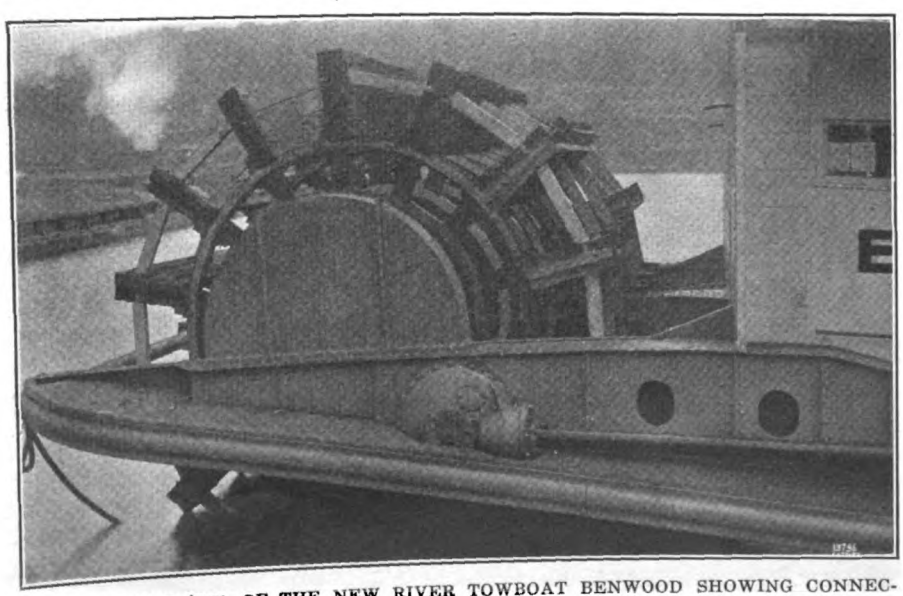
Recently Completed Sternwheel Towboats Benwood and Class Have Two Diesel Engines—Maximum Efficiency and Maneuvering Flexibility

BY R. H. BACON

DURING the past few years there has been a very rapid development in shallow draft vessels for river service and a great improvement in both the design and construction of this type of craft. New river boats which illustrate the development work which is going on in this field are the towboats BENWOOD and BETTY which have recently been completed by The Dravo Contracting Co., Pittsburgh. The BENWOOD is owned by the Wheeling Steel Corp., Wheeling, W. Va., and the BETTY is owned by the Keystone Sand & Supply Co., Pittsburgh.

The erection of a third towboat will follow very shortly. This boat forms a part of a general program of stock towboat, dredge and Barge construction which the Dravo company regularly pursues in order to make possible immediate delivery on equipment of this character to meet the demands of the river interests.

In the layout of these boats all of the latest developments in river boat design are in evidence. Among these are featured the use of all steel construction in both hull and superstructure; twin diesel engine drives with each engine driving its section of the split stern wheel; unit type of reduction gear for the stern wheel drive and unusually complete pilot house arrangements.



SPLIT STERNWHEEL OF THE NEW RIVER TOWBOAT BENWOOD SHOWING CONNECTION BETWEEN DRIVE SHAFT AND THE WHEEL—THERE IS A SIMILAR BEVEL GEAR TRANSMISSION ON THE OTHER SIDE—EACH ENGINE DRIVES ITS OWN SECTION OF THE STERNWHEEL

As shown in the accompanying illustration of the BENWOOD this vessel is a trim craft with lines which are a considerable improvement over towboats of a few years ago. From the sturdy towing knees to the structure for supporting the split wheel the BENWOOD and BETTY have a smoothness of line which indicates the care with which the design was laid down.

The boats have the following dimensions: Molded length 126 feet 6 inches; length over all 149 feet 7 inches; beam molded 26 feet 6 inches; beam over all 27 feet ½-inch; crown of deck 6 inches; depth amidship 5 feet 6 inches.

Recent trends in both the type of power and the arrangement of driving units are to be noted. The two 240-horsepower Fairbanks-Morse diesel engines are each direct-connected to a section of a split stern wheel. This use of two diesel engines each engine driving its own wheel offers such unusual flexibility in operation and in maneuvering characteristics that

much is to be said in its favor as compared with the use of a single engine of larger horsepower. Trial trips of the BENWOOD for instance demonstrated that with the rudders in the hard over position and with one engine operating one wheel in one direction and the other engine operating its wheel in the reverse direction it was possible to move the boat out from the wharf at right angles to the longitudinal axis of the vessel. Again by rotating the wheels in opposite directions and with the rudder set in its center position it was possible to pivot the boat on a point represented by the vertical axis of the stern wheel. These unusual maneuvering characteristics are particularly important in shallow draft work where it may be necessary to navigate unusually crooked streams.

Two Engines Located Forward

The two 240-horsepower diesel engines are set slightly at an angle with the longitudinal axis of the towboat and are connected through air-oil operated clutches to 4⅞-inch drive shafts which are supported by ring oiling bearings. The sections of the shaft are connected together with DeLaval flexible couplings and the drive to the stern wheel is through a special unit type of reduction gear which has been developed and patented by The Dravo Contracting Co. This gear drive is quite interesting as it shows the great improvements which have been made in applying diesel engines in river boat service.

The various solutions of the driving problem, of which this is a fine example, is one of the reasons why the diesel engine is being so rapidly adopted for river boat work. In this case the stern wheel drive consists of a bevel pinion which meshes with a bevel gear and on the bevel gear shaft is a spur pinion which drives a large spur gear which is keyed to the shaft of the stern wheel. The total reduction is 1 to 12.4 which, with a rated engine speed of 257 revolutions per minute, gives a speed at the stern wheel of 20 revolutions per minute.

From Mine to Market

When there is an economic demand for improved types of equipment the resourcefulness of American engineers is recognized. The greater use of our great inland river waterways in the profitable carriage of cargoes is definitely opening up. Modern river craft with economical diesel engine propulsion are being constructed by river shipyards in increasing numbers. This article describes and illustrates in detail one of the most recent of these vessels. Three in all of similar design have been or are being built. The low operating costs for boats of this type will materially help to stimulate river traffic.

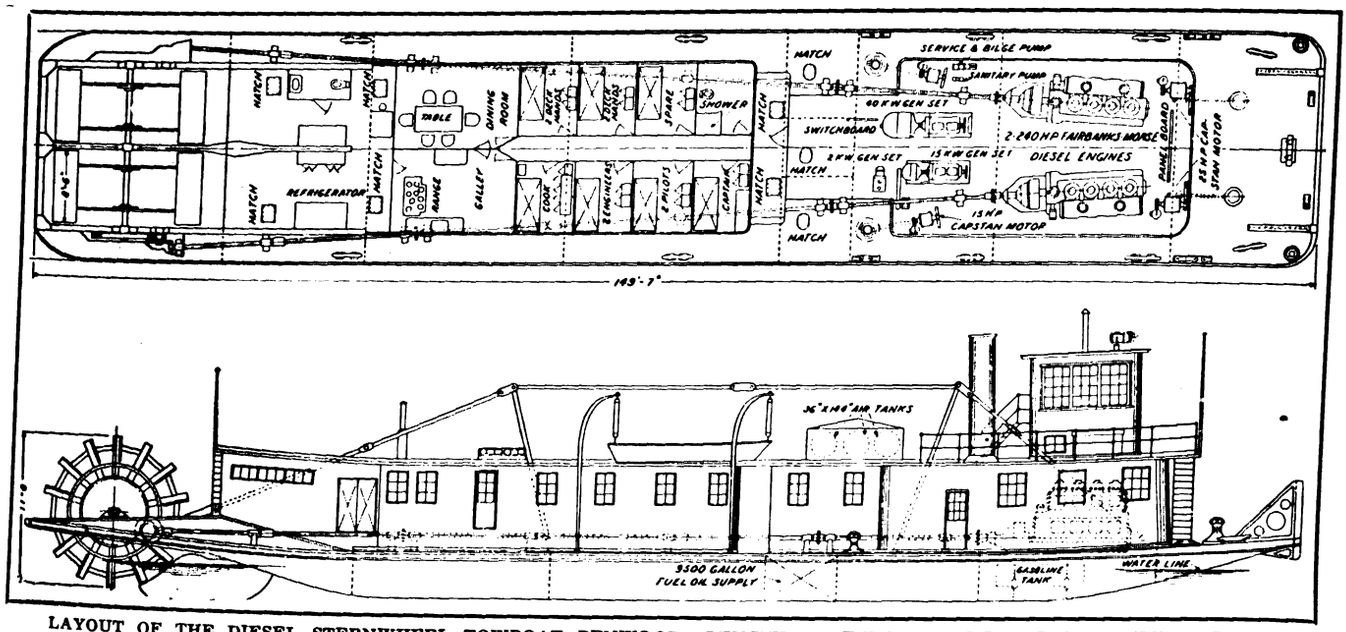
The pinions are of forged, high carbon steel and are heat treated while the bevel gears of the two drives are carbon steel which has been forged and oil tempered. The large spur gears are of high carbon cast steel with cut teeth. All of the bearings in the stern wheel drive are Timken roller bearings arranged to take the radial and end thrust. The bearings supporting the stern wheel shaft are standard sleeve bearings, which are lubricated with an Alemite high pressure system so that it is unnecessary to climb over the stern wheel to screw up grease cups. The center grease gun which lubricates all these bearings is located at the stern of the boat.

Another interesting detail in connection with the stern wheel construction is a pipe which connects with the circulating water system on the engine so that it is possible to discharge hot circulating water over the stern wheel in order to remove ice during winter operation.

Has Centralized Control Panel

Returning again to the engine room it will be noted from the illustrations that a centralized control panel is located just above the operating aisle between the two engines. This panel is equipped with two Brown electric tachometers which show the speed of the engine. There is also a pyrometer with its control switch mounted on the board. This control switch has eight points so that it is possible to read the operating temperatures of any of the cylinders of the two engines by this one indicator. A gage for the starting air pressure is also provided as well as a clock and the two engineroom telegraphs are also mounted on this board.

The two 240-horsepower diesel engines are equipped with built-in air compressors although these particular compressors are not standard compressors ordinarily furnished as a part of these engines. In this case the compressors are the two-stage intercooled type with a capacity of



LAYOUT OF THE DIESEL STERNWHEEL TOWBOAT BENWOOD. LENGTH 149 FEET 7 INCHES, BEAM 27 FEET, DEPTH 5 FEET 6 INCHES

TABLE I

Additional Facts About Diesel River Towboats Benwood and Class

Description of Hull

The hull is of all steel with straight sides, flat bottom, scow bow and is built on the transverse system of framing. There are four water tight transverse bulkheads and two transverse oil tight bulkheads, dividing the hull into six compartments and with two longitudinal oiltight bulkheads into three oiltight compartments for fuel.

The bottom plating is of 5/16-inch thickness, the side plating is ⅜-inch and the deck plating ¼-inch. The turn of the bilge is formed with a 12-inch radius. Longitudinal seams are lapped and single riveted; transverse seams in the bottom are lapped and double riveted, transverse seams in deck at center of the boat are treble riveted. All shell rivets are of ⅝-inch diameter.

Deck Fittings

Four double and four single roller chocks and two button roller chocks on bow and chain plates are provided.

Towing knees as shown in the accompanying illustration are built of 15.3-pound plates stiffened by ⅜ x 3 x 4-inch angles, and 12-inch x 25-pound channels fitted with 8 x 12-inch oak head piece and ½-inch face plate.

Deck House

The deck house sides are of 5-pound plates stiffened with ¼ x 2 x 3-inch angle. The roof is of No. 9 gage steel plating and supported by 4-inch x 6.25-pound channel carlins, increased to 6-inch x 8.2-pound channels in way of the concentrated loading. The beams and side angles are spaced about 25 inches between centers.

In quarters the ceiling and the sheathing on the outside bulkheads are of ¼-inch vehisote board framed with white pine nailing strips. The inside partitions are of 5/16-inch vehisote board. Doors are of steel for the engine room and of wood for quarters. The swash bulkhead is of No. 9 gage steel stiffened with angles.

Pilot House

The pilot house is constructed of 5-pound steel sheets stiffened with angles. It is 13 feet 5½ inches wide, 13 feet long and about 12 feet high. The floor is raised about 4 feet above the roof of the deck house. A wooden door at the aft end leads out to the cabin deck. There is a leather cushion seat at the after end and a small table. A stove is also provided.

Hog Rods

The vessel is fitted with two fore and aft hog rods of 1⅛ x 4-inch eye bars supported by 7-inch extra heavy pipe stanchions. Turnbuckles are provided for adjustment.

Capstans

At the forward end of the vessel there are two single barrel heavy duty Dravo capstans, operated by 25-horsepower, 110-volt, direct current General Electric motors. The motors are connected to the capstans through spur and bevel gears. Provision is also made for hand operation. Two lighter duty capstans are installed amidship, operated by 15-horsepower, 110-volt, direct current General Electric motors by means of spur and bevel gears. Solenoid brakes are furnished for all capstans and in addition the foreward capstans are provided with pawls.

Steering Engine, Pumps, Compressor

The steering engine is of Western river ram type of 7-inch diameter and 7 feet 3⅜-inch stroke, and is operated by compressed air.

There is a sanitary pump 2½ x 2½ x 3 inches operated by air and provided with a governor to maintain a pressure of 15 pounds on the system. This pump draws from the river and delivers water to the hot and cold water system. There is also a bilge and service pump of 3¾ x 4 x 4½ inches horizontal duplex type, operated by air.

An auxiliary air compressor of single stage 4½ x 5 inches is driven by a belt from the 14-kilowatt generating set.

Refrigeration

Refrigeration is furnished by a unit of the Kelvinator type with a capacity of 45 to 54 cubic feet. To drive this refrigerating unit a 2-kilowatt Kohler generating set is provided. This set will also supply current for night lights. The ice box is located in the tiller room and consists of a Leonard ash case refrigerator equipped with shelves and meat hooks.

Stern Wheel

The stern wheel is built in two halves, each independent of the other and of 17 feet 8 inches diameter and 8 feet 6 inches length. There are fourteen buckets 32 inches wide made up of two inside planks 2 x 12 inches and one outside plank 3 x 10 inches all of white oak. The stern wheel arms are made of 2½ x 8-inch white oak. Each wheel has three cast steel wheel flanges. The shaft is circular, 8¾ inches in diameter and is made of forged 0.60 to 0.70 carbon steel.

Rudders Tillers and Pilot Wheel

Three balanced rudders are provided made of 3¾-inch white oak. The rudder stocks are of 7-inch double extra heavy pipe and are supported by cast steel bearings and rudder carriers of the conical type.

Rudders, Tillers & Pilot Wheel—Continued

The rudder trunks are of 9-inch standard pipe properly connected to the lower bearings and at deck, and extending 2 feet 6 inches above deck. The rudder carriers and upper bearings are combined and are located at the upper end of the rudder trunks and effectively connected thereto. The bearings are bronze bushed and the tillers are of plate and angle type of proper strength and rigidity. The tiller line is ¾-inch diameter rope leading over 14-inch sheaves to the pilot house for operation of the rudders by hand if necessary. There is provided a tiller indicator operated from the wheel drum. Swing of the rudder is permitted to about 37 degrees on each side. The pilot wheel is 9 feet in diameter and is provided with a 12-inch diameter cast iron drum.

Life Saving Equipment

Life saving equipment consists of six floats of the standard type, two ring buoys and a 16-foot work boat of river type with two pairs of oars. This boat is stowed under round bar davits with roller bushed blocks and tackle. An extra pair of davits is located on the opposite side of the vessel but without tackles.

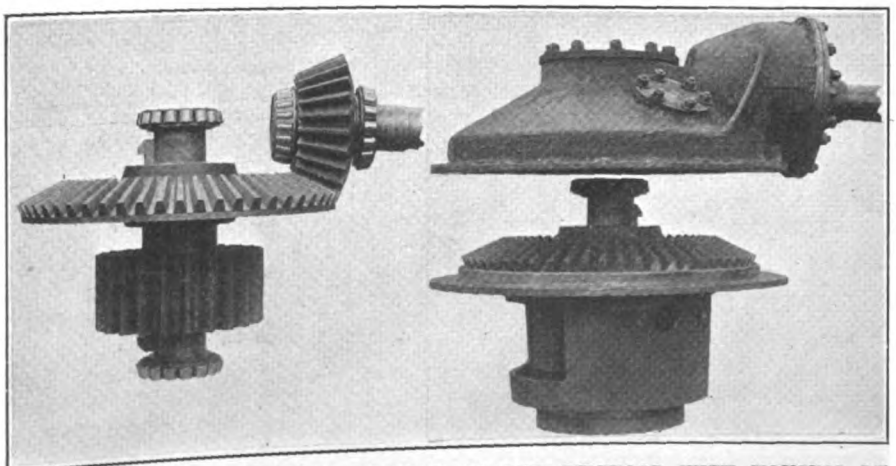
Crew's Quarters

Outside windows are of the drop type. Transoms from crews quarters to hallways are provided for air and ventilation. The toilet has a shower, two wash basins and one commode. There is provided a range fitted with water back and connected to a hot water tank. There is also a sink with drain board and built-in cupboard with glazed doors. Two mushroom ventilators 11 inches in diameter are fitted above the passage in the crew's quarters.

Equipment and Painting

The vessel is provided with an anchor of about 600 pounds weight. There is also a ship's bell of about 10 inches in diameter. A Strombos triplex whistle is provided and is piped for operation by means of air. Fire equipment, water buckets and racks for buckets, rope hooks and hangers are furnished. A jack staff is provided and a lashing ring is fitted at the stern bulkhead. When the vessel was under construction all steel faying surfaces were given one coat of red lead before assembling. After riveting up the entire steel structure except in way of fuel bunkers was given one coat of red lead and two finishing coats of the final color. The woodwork in way of crew's quarters was given one priming coat of white lead and two finishing coats of final color and two coats of varnish.

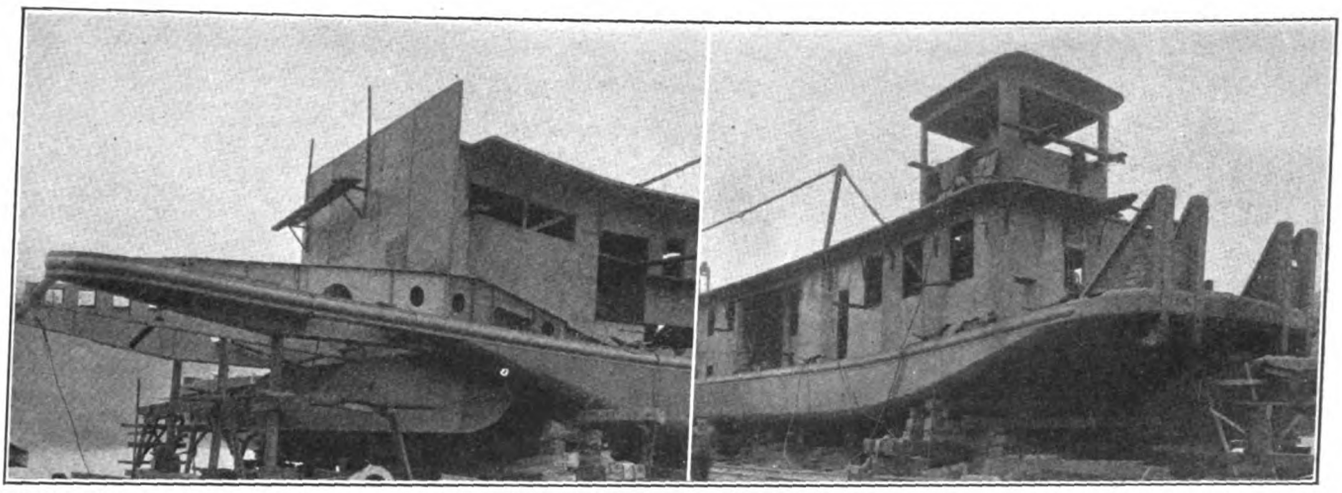
90 cubic feet. The air pressure carried is approximately 200 pounds. The air supply is stored in three air tanks with a total capacity of 234 cubic feet. With the extra large compressors which are provided and the air tank capacity, the boats can meet the most unusual maneuvering conditions with a certainty that ample supply of air will be available.



AT LEFT—STERNWHEEL DRIVE GEARING OF THE BENWOOD WITH HOUSING REMOVED—AT RIGHT—STERNWHEEL DRIVE GEARING WITH HOUSING IN PLACE

The exhaust from the main engines is handled in each case by a copper exhaust pipe which attaches to the exhaust manifold of the engine and passes up to a water base which forms the base of each stack. This water base cools and cleans the exhaust and also has some silencing effect. The auxiliary units also exhaust into these water bases.

One interesting detail connected with the Climax auxiliary gasoline engine units is the fact that these units, one of which is 60-horsepower, 4-cylinder, 6 x 7-inch unit driving a 40-kilowatt generator and the other 24-horsepower engine of 4 cylinders, 5 x 6½ inches driving a 14-kilowatt generator, are radiator cooled. The explanation for this method of cooling is that these engines are frequently operated while the vessel is tied up at the wharf and it was desired



STERNWHEEL DIESEL TOWBOAT BENWOOD UNDER CONSTRUCION—AT LEFT—STEEL WORK FOR THE STERN TO HOLD THE WHEEL, ALSO THREE RUDDERS IN PLACE. AT RIGHT—FORWARD END SHOWING DECK HOUSE, PILOT HOUSE AND THE TOWING KNEES

to free the engineer from the necessity of looking after a circulating water system for the auxiliary units. The 24-horsepower engine is also belt connected to a 4½ by 5-inch auxiliary compressor as an adjunct to the regular air starting equipment. The electrical end of both generating sets were furnished by the General Electric Co.

Fuel oil is carried in three hull compartments which are formed by two oil tight bulk heads and two dividing partitions which split the compartment into three sections. The total capacity is 9500 gallons which is sufficient for 30 days normal operation.

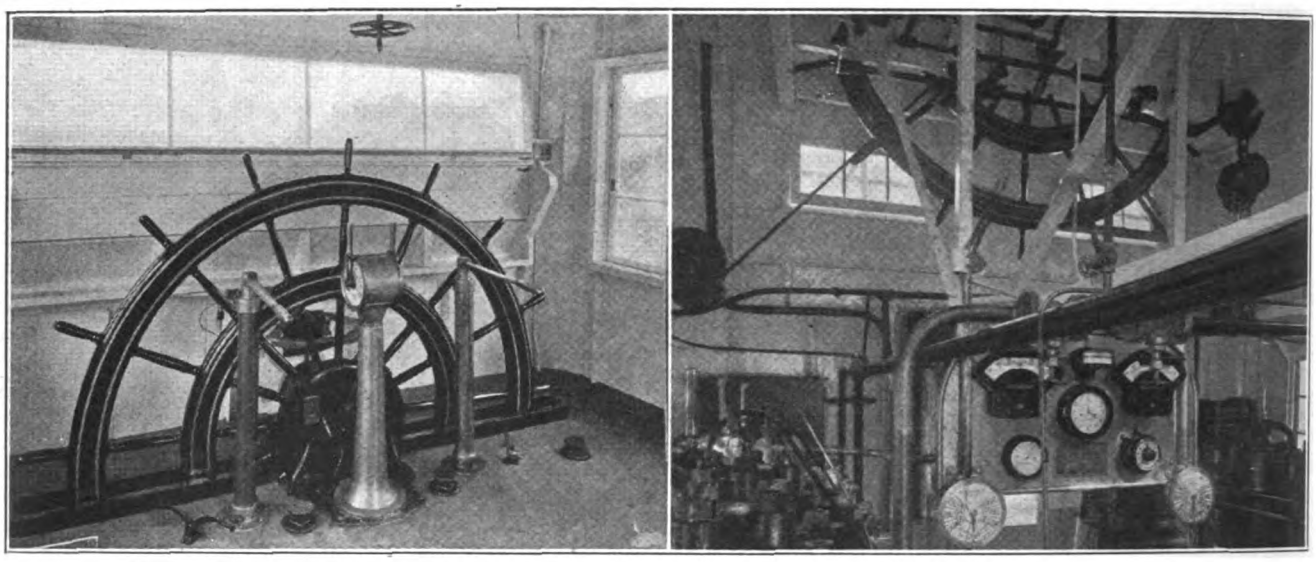
Both the sanitary system and the bilge pump are air operated and the bilge pump connections are so arranged that any compartment can be pumped out.

Complete motor driven capstan equipment is provided, the two forward capstans being driven by 25-horsepower motors and the two side capstans with 15-horsepower motors. All these motors are of the heavy duty crane type with resistance control and are equipped with solenoid brakes. The type of motor used is very similar to those used on street railway cars.

The heating of the vessel is taken care of with a vacuum type vapor system using a Winchester capital boiler which was supplied by the United States Radiator Co.

Reference was previously made to the fine maneuvering characteristics of the boats and one of the reasons why this is possible is due to the very complete arrangement of the pilot house equipment. The first detail that strikes the observer entering the pilot house is the fine black walnut wheel of the two circle type. This wheel is inlaid with maple and is in itself a very fine example of skilled craftsmanship. Directly behind the center of the wheel is located the double control Cory engine room telegraph, one side for each engine,

ENGINE ROOM OF STERNWHEEL TOWBOAT BENWOOD—TWO 240 HORSEPOWER FAIRBANKS-MORSE DIESEL ENGINES—CLUTCH CONNECTED TO THE STERNWHEEL DRIVES—IN FOREGROUND TWO RADIATOR COOLED CLIMAX GASOLINE ENGINES DRIVING GENERAL ELECTRIC GENERATORS



AT LEFT—INTERIOR OF PILOT HOUSE OF TOWBOAT BENWOOD—A DOUBLE ENGINE ROOM TELEGRAPH OF CHAS. CORY & SON TYPE—TWO STEERING COLUMNS AND FOUR FOOT PEDALS FOR CUTTING OFF AIR TO STEERING ENGINE AND AT SAME TIME ACT AS BRAKE ON WHEEL—TWO OF THE PEDALS ACT AS BRAKE ON WHEEL—TWO OF THE PEDALS OPERATE THE STROMBOS WHISTLE—AT RIGHT—ENGINE ROOM OF THE BENWOOD BELOW PILOT HOUSE SHOWING THE LOWER HALF OF WHEEL AND THE MECHANISM WHICH CONTROLS THE STEERING ENGINE OPERATED FROM THE FOOT PEDALS ABOVE

and the two steering columns are located on each side of the telegraph pedestal.

Through a very interesting linkage arrangement the two levers on the steering columns not only control the opening of the air valve which admits air to the Western river ram type of steering engine but also releases the brakes which lock the wheel.

A distinct improvement over the automatic brake consists in mounting a V-groove steel brake rim directly on the hub of the pilot wheel. The linkage arrangement from the levers on the steering columns operate this automatic brake through contacts by double pivoted V-type asbestos metallic blocks. This eliminates the use of the leather lined brake which grabs on to the rim of the pilot wheel, damages the finish, and in time serves to weaken the wheel due to the constant applying of the brakes.

Four foot pedals have also been provided as shown in the view of the pilot house, which are automatically raised as soon as either of the steering levers are thrown into a position where the valve which admits air to the steering engine is opened. Two of these foot pedals are located near the side windows and so it is easy for the pilot to stop the movement of the rudders by stepping on the foot pedal which is next to him. When any one of these four foot pedals are depressed the brake is applied to the wheel. As long as the steering levers are in the operating position the steering engine continues to move the rudders over unless stopped as mentioned. A tiller indicator operated from the wheel drum shows the course of the vessel at all times.

There are three balanced rudders built of 3¾-inch white oak securely drift bolted together and reinforced with plates and bars. The rudders also have a fin plate about 24 inches wide at the aft end tapering to the width of the angles at the rudder stock. The rudder trunks are 9-inch extra heavy pipe and both the lower and upper bearings are bronze bushed.

There are also two foot pedals in the pilot house which control the Strombos triple gong whistle. On the roof of the pilot house is a 19-inch search light which is controlled by a hand wheel just above the pilot's head. With this control it is possible to swing this search light both vertically and horizontally so that the beam can be focused at any point desired.

The layout of the BENWOOD and the BETTY shows that considerable thought has been given to the comforts of the crew. The quarters are well arranged and include six rooms and bath room. The complete equipment of the galley includes a Kelvinator refrigerating unit. Current for operating the refrigerator is supplied by a 2000-watt Kohler generating set located in the engine room. This set is of the automatic type and is connected to the circuit connecting the night lights. Whenever the thermostatic switch on the refrigerating unit closes or when one of the night lights is turned on the set starts up automatically. The flooring in the quarters is covered with 3/16-inch battleship linoleum laid with cement.

The complete design of the BENWOOD was developed by The Dravo Contracting Co. F. R. Dravo is president of the Dravo organization, and V. B. Edwards, vice president and general manager.

John F. Metten Appointed Vice-President

The American Brown Boveri Electric Corp. officially announced April 29 that the corporation had executed a contract with the United States navy, for the completion of scout cruiser SALT LAKE CITY and the machinery for the scout cruiser PENSACOLA for approximately eleven million dollars, and that the corporation had been awarded a contract by the navy, for an additional cruiser; these contracts aggregating twenty-one million dollars.

With the announced withdrawal of Wm. Cramp & Sons from the shipbuilding industry, American Brown Boveri has been able to engage the services of John F. Metten, previously vice president and chief engineer of Cramps, as vice president in charge of marine engineering. This combines in American Brown Boveri the engineering knowledge and practical skill of two great American shipbuilding companies and assures a satisfactory operating organization to carry out the program in hand and in prospect.

Two agreements of the American-Hawaiian Steamship Co. providing for the shipment on through bills of lading of goods from Atlantic coast ports to Gray's Harbor, Wash., have been approved by the shipping board.

Are Lake Vessels Efficient?

Some Comments on a Recent Article—A Reduction in Operating Cost Is Possible with Modern Propulsive and Auxiliary Machinery

BY R. C. STANBROOK

IN HIS article, "Reduce Lake Vessels' Fuel Bill," published in MARINE REVIEW in four parts, beginning in the February issue, Henry Penton has brought up some interesting questions, and, while one must read the article with the respect due to his experience, it seems to embody largely an expression of opinion rather than a statement of definite proofs of the questions raised. Not in a contentious spirit but in the interest of better marine engineering practice it may be worth while to look into some of the points brought out by Mr. Penton.

It is to be regretted that so few real boiler tests have been made on lake vessels. A test which stops at weighing the water and coal without striking a heat balance can hardly be called a real boiler test. The tests which Mr. Penton shows in Table I have only gone half way and the boiler is held responsible for the combustion, a factor over which the type and design of the boiler can have little control. Combustible in the ash and the CO_2 content of the flue gases are largely a matter of having a good fireman and this human factor can easily account for 5 per cent in the efficiency of the boiler. If we neglect to take CO_2 readings and to weigh the ash and determine the quantity of combustible in the ash, we can only assume these factors to equalize each other in making a comparison. We then have a possible error of at least 5 per cent.

Two Installations Not Comparable

The water tube boiler WT_2 is compared with the two scotch boilers S_1 and S_2, both of the latter having air heaters. The temperatures of the gases leaving the boiler in these two cases are not given, but these temperatures have been reduced to 255 degrees Fahr. and 265 degrees Fahr. respectively, through the air heater. The heat represented by this drop in temperature has been used to raise the temperature of the air supply from say 80 degrees Fahr. to 298 degrees Fahr. and 308 degrees Fahr. respectively, this heat being returned to the boilers. What we really have in tests S_1 and S_2 is not the boiler efficiency, but the combined efficiency of boiler and air heater. This efficiency is then used in a comparison to the detriment of the water tube boiler using unheated air. It is a common practice to use air heaters or economizers with water tube boilers and if this type of equipment were used with boiler WT_2 to bring the stack gas temperature down from 445 degrees Fahr. to 298 degrees Fahr. we would gain about 3.5 per cent making the watertube boiler compare favorably with the scotch boilers.

Should Determine B.t.u. in Coal

In tests WT_1 and WT_2, the b.t.u.s of the coal have not been determined and the only reason the tests have been included seems to be to show "water per pound of coal from and at 212 degrees Fahr." Pounds of coal have little interest for the engineer unless he knows the b.t.u. and, if the owner is buying coal without some check on the b.t.u., a revision of his purchasing methods should promise some savings. In Table II Mr. Penton condemns water tube boilers on the basis of "pounds of coal per indicated horsepower hours for all purposes." Again we do not know the b.t.u. of the coal used in the various tests and it is unfair to make comparisons unless one assumes that the averages will give reliable results. So many factors enter into "coal per indicated horsepower for all purposes," that one should hesitate to condemn any one piece of equipment without testing separately for the efficiencies of the various units comprising the installation.

It would seem that the question of scotch versus water tube boilers at 175 to 225 pounds pressure per square inch and triple versus quadruple expansion engines at about 3000 indicated horsepower will continue to be an open one.

Use Efficient Surface Condensers

With regard to surface condensers, it is clear that considerable improvement could be made over any condenser which gave a difference in condensate temperature and the theoretical temperature due to the pressure of 20 degrees Fahr. Some condensers have apparently been built with the idea of getting as much cooling surface in as small a space as possible. A well designed condenser with good distribution of the steam, ample steam lanes and effective air extraction, should not give a temperature difference of more than 10 degrees Fahr. under operating conditions. This is equally as good as a jet condenser, where one observation of conditions will usually show a hotwell temperature of 125 degrees Fahr. with 24-inch vacuum, a difference of 15 degrees Fahr. Mr. Penton's figure of 3½ per cent fuel saving in favor of the jet condenser is fictitious. The quantity of water required to condense a given amount of steam is independent of the condenser and this water has to be pumped whether by a large air pump as in the jet, or a separate circulator as in the surface condenser. There is some difference in the friction head in favor of the jet condenser represented by less than 4 horsepower for a 2500 indicated horsepower engine.

Turbines and Reduction Gears

A modern, well designed surface condenser does not require much upkeep and it certainly is good to have the vacuum when handling the vessel. The extra investment is not large if the cost of an adequate purifier is added to the cost of the jet condenser and will be easily repaid by having clean feed water for the boilers.

The impression one gets from the article under consideration, is that the marine engineering of 25 years ago, cannot be much improved on. From a survey of the more recent lake vessels, one would be inclined to agree. There have been few improvements except in minor details. This seems strange when we consider the progress which has been made ashore where we now have modern electrical power plants with their kilowatt hour per 14,000 b.t.u.

The turbine is given scant consideration and the subject is dismissed with the statement "the turbine is absolutely dependent upon superheat." It is interesting to note that many turbines have been installed to utilize the exhaust from existing reciprocating engines, and have developed when working with 28½-inch vacuum, as much power

The author, R. C. Stanbrook, is an engineer attached to the staff of the Bradley Transportation Co.

as the original engine at 5 pounds per square inch back pressure. The high pressure turbine on the modern reheat installation does not use superheated steam. In the marine field we have a number of very successful ships with reciprocating engines on the outboard shafts exhausting into a turbine on the center shaft.

An investigation of the field of higher pressures and temperatures as applied to lake vessels would be worthy of the owners' attention. An installation with steam at moderately high pressures of say, 350 pounds per square inch and a total temperature of 750 degrees Fahr. with the necessary turbine and reduction gear should give us a water rate of less than 8.5 pounds per shaft horsepower or a b.t.u. rate of 12,500 for main propulsion, corresponding to about 14,000 for all purposes if we go to electrification of auxiliaries.

The thermal efficiency of such an installation is beyond question and the reliability of geared turbines has been demonstrated. The record of the S. S. ALGIC published in the March MARINE REVIEW is interesting in this respect.

Use of Powdered Coal

The use of powdered fuel for marine work has come to the fore and promises a saving of about 5 per cent owing to better combustion. Its adaptation to scotch boilers has not been quite worked out but it could be used now with water tube boilers, with some alterations to the furnace.

While one cannot quarrel with Mr. Penton in his choice of scotch boilers for moderate pressures up to 200 pounds per square inch, it is at the higher pressures that the water tube boiler finds its exclusive field. The use of a scotch boiler with poppet valve reciprocating engines as advocated, is only scratching the surface of "fuel savings." The modern 600-foot lake freighter has a b.t.u. rate of 25,000 per shaft horsepower and a turbine installation such as outlined in the foregoing would show a fuel saving of 44 per cent.

The very bad water rates of auxiliary equipment is mentioned, and, while it is not always desirable to hang all the auxiliaries on the main engine, few engineers will disagree on the economies to be gained by the electrification of auxiliaries.

We have electrical drives of proven reliability and economy, both for engine room and deck machinery, yet how many vessels do we find on the Lakes so equipped. This seems to be typical of our lack of progress.

Owners seem averse to putting any more capital than is necessary into their vessels, but if a good return can be shown for additional expenditure, it would seem to be good business. This can only be determined after a careful survey of their vessels' trade, taking into account full running time, checked time and harbor time. Another feature is the upward tendency of the cost of coal which will make fuel saving investments increasingly profitable.

To Enter Service in June

S. S. Yarmouth Is Nearing Completion

WORK on the fine new steamers YARMOUTH and EVANGELINE building at William Cramp & Sons Ship and Engine Building Co. for the Eastern Steamship Co. is progressing in a satisfactory manner. No expense is being spared to make these two ocean passenger vessels for the run between Boston and Yarmouth, N. S., and New York and Yarmouth, truly luxurious and comfortable in accordance with the highest standards of shipbuilding and good taste as exemplified by the best along these lines that the country can produce. The S. S. YARMOUTH was launched Nov. 6, 1926, and the EVANGELINE on Feb. 12, 1927. It is expected that the YARMOUTH will have completed her trials and will be ready to enter service in June. The EVANGELINE will follow some time later.

Every feature of design in these vessels has received careful study by Theodore E. Ferris, who has for years been kept busy at his profession in spite of the poor condition of shipbuilding, which after all is an indication of the high value in which his skill is held. The lines were worked out and models tested to obtain a shape to give minimum resistance at the speed desired. A through schedule of 33 hours from New York to Halifax is possible with the 18-knot speed anticipated.

Each vessel will be equipped to carry 751 passengers. The furnishings and appointments are laid out on a lavish scale. Public rooms include two social halls, a library, writing room, lounge room, music room, dancing saloon, smoking room, veranda cafe and glassed in promenade deck. Accommodations are provided for 589 first-class passengers and there are berths for 162. Couch berths will be fitted in 70 state rooms in addition to the regular lower and upper berths, so that if desired three persons may occupy one stateroom. Other staterooms have three-quarter width lower berths and a single upper berth. There are ten special suites paneled in mahogany and these have private baths and twin beds.

These vessels are 379 feet 3 inches in length overall; 365 feet in length between perpendiculars; 55 feet 6 inches in breadth molded; 29 feet 6 inches in depth molded and have a designed draft of 18 feet and a maximum draft of 20 feet. The displacement at 18 feet draft is 5905 tons and the gross tonnage is about 4800. They are of three deck superstructure type and have a continuous promenade and boat deck making five decks in all. The stern is of cruiser type and the stem is raked forward. Each ship is equipped with a complete double bottom. Four hatches are served with electric freight elevators through the main and lower deck. There are eight watertight steel bulkheads. The deck houses on the promenade and boat decks are of steel. Particular attention has been given to the cargo space with a view to carrying automobiles.

Propulsion By Geared Turbines

Any engineer would take delight in looking over the propelling machinery of the YARMOUTH and the EVANGELINE. It is without exaggeration probably as good in every detail as can be produced in this country. Cramps have for many years had an excellent reputation as shipbuilders and the machinery designed and built by this company has won high recognition for quality and dependability both in the naval and merchant services. Two sets of cross compound single reduction geared turbines of Parson's type, built by Cramps furnish the propulsive power. The single reduction gears for each set of turbines in both ships were designed and built by the De Laval Steam Turbine Co. The success which this type of gear has shown in a number of important marine installations determined the choice in this case. About 3800 shaft horsepower is transmitted from each turbine to each screw. Steam is furnished by six scotch type, single ended, four-furnace boilers of 16 feet 4 inches in diameter by 11 feet

6 inches long with a working pressure of 210 pounds and arranged to burn oil. The boilers were made by Cramps.

When completed the YARMOUTH and EVANGELINE will be, in hull, propulsive machinery, auxiliary equipment and accommodations the finest vessels of their size that can be turned out in any American shipyard. It is a pity indeed to think that it is necessary for a yard capable of such work to shut down completely on shipbuilding, to turn its facilities to more profitable work.

Harry Coulby, Giant Lake Freighter Launched

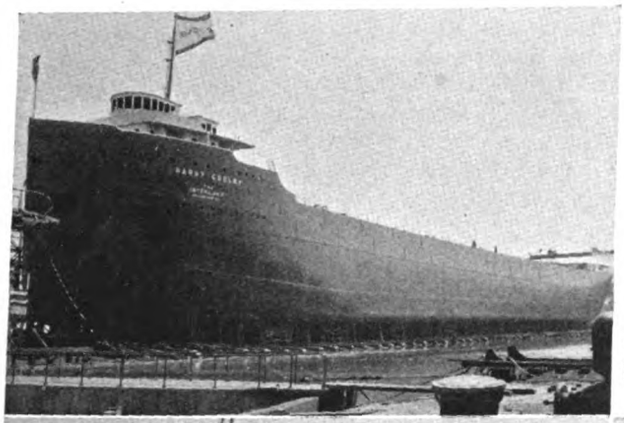
THIS steamer, the largest bulk coarse freight carrier on the Great Lakes under American registry, is 630 feet 9 inches in length overall, 607 feet between perpendiculars, 65 feet in beam and 33 feet deep. The keel was laid Feb. 7, 1927, and she was launched April 30 at the Lorain, O. yard of the American Ship Building Co. The owner is the Interlake Steamship Co., Pickands & Mather managers, Cleveland.

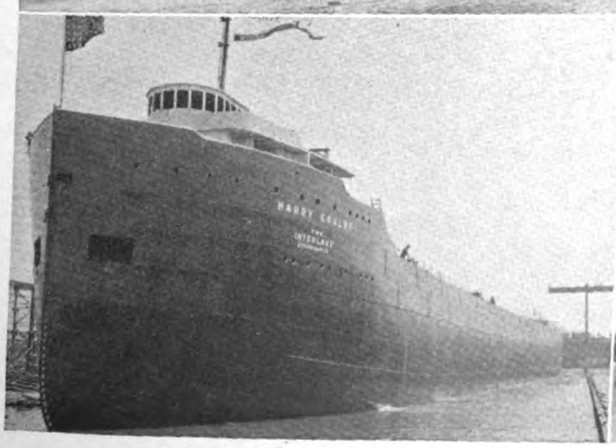
The main engine is of triple expansion, heavy duty type, with cylinders 25½ x 41 x 67 inches with a common stroke of 42 inches. At 95 revolutions the engine will deliver 3000 horsepower. The ballast system is built around two 15-inch centrifugal and two 10 x 14 x 16 inches vertical drainage pumps. Besides the ballast pumps, there are eleven other independent pumps for various services, in addition to two 25-kilowatt and one 15-kilowatt generators.

A sanitary system supplying the entire ship draws from two 6000-gallon fresh water tanks and discharges to all basins, tubs and shower baths with hot and cold water at 40 pounds pressure. Pure distilled drinking water is supplied throughout the vessel by special pipe lines.

There are three boilers of the Babcock & Wilcox marine water tube type with a total heating surface of 9345 square feet, and built to operate at a working pressure of 215 pounds with 60 degrees superheat.

The accompanying illustrations show the great steamer, before, during and after launching, Mrs. Kenneth A. Scott, the sponsor on the launching platform, and in the group, L. C. Barnett, Mrs. Scott, and Harry Coulby, partner in Pickands & Mather, after whom the vessel was named.





Diesel-Electric Is Practical

In Special Cargo Service Between St. Lawrence and Great Lakes —Maximum Maneuvering Flexibility Through Restricted Waters

BY H. C. COLEMAN

REPORTS of the United States Steel Products Co. on their Lake freighters show that the diesel-electric driven STEEL ELECTRICIAN in service between St. Lawrence ports and the Great Lakes has been satisfactory in all respects. Her performance would indicate that similar drive will be fitted in additional vessels for this service when required.

The STEEL ELECTRICIAN, although not nearly as large as the lake ore carriers, because of the dimensions of the locks of the Welland canal through which she must pass in her regular trade, is constructed along similar lines in that the propulsion machinery is all located as far aft as possible, with an after deck house for the engine room force, and with the wheel house and quarters for deck officers and deck hands forward. The vessel is designed for carrying steel plates, rails and structural shapes, and is, therefore, provided with two large cargo hatches, each 40 feet by 20 feet, and each opening into a cargo hold about 80 feet long. Special provision is made for handling the cargo, much of which is in very large pieces, by two 5-ton electric revolving cranes, similar to the usual land locomotive crane, which replace the usual deck winches. The vessel is unique in this respect, along with its sister ships, the STEELVENDOR, STEELMOTOR, and STEEL CHEMIST. These vessels are all of the same size except for a few inches in the overall length, and are practically duplicates in all details except for machinery arrangement. Each of the first two above named ships is propelled by a 750 shaft horsepower, 135 revolutions per minute, 6-cylinder, 4-cycle, air injection diesel engine, while the STEEL CHEMIST has a 950-horsepower, 165 revolutions per minute, 6-cylinder, double acting, air injection, diesel engine.

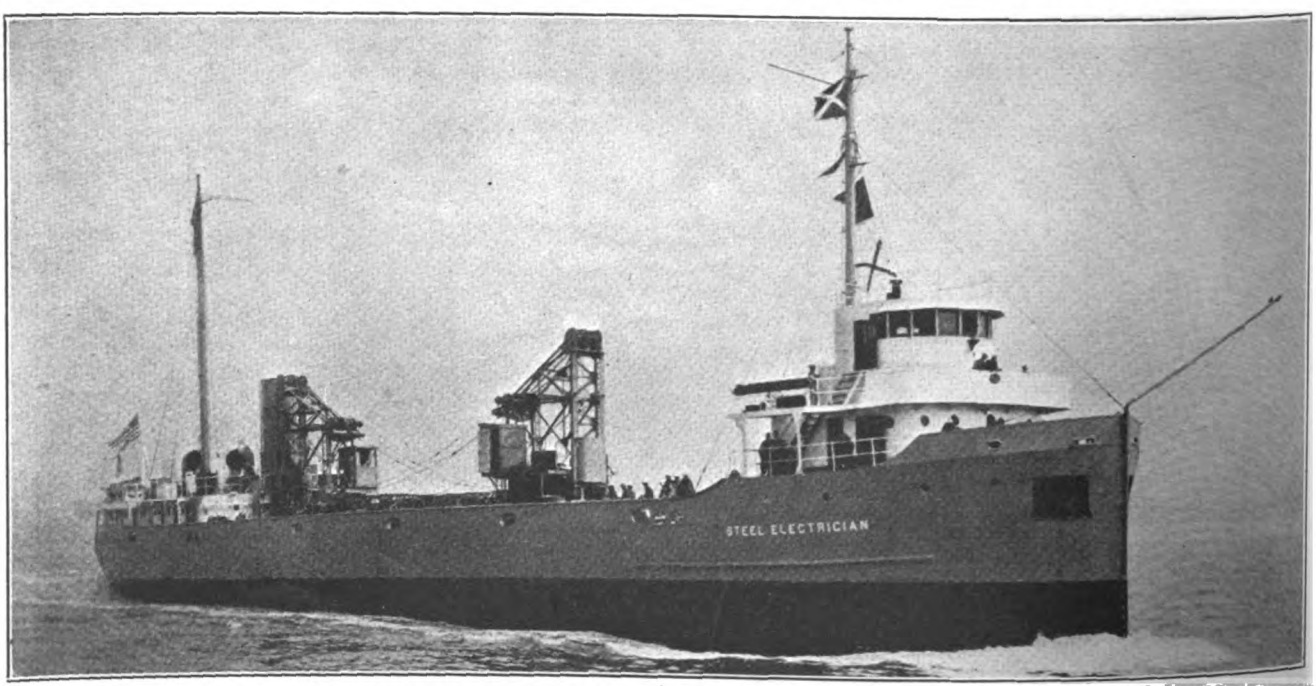
The following are the chief characteristics of the STEEL ELECTRICIAN:

Length overall ft. in.	257	11⅝
Length between p.p. ft. in.	250	0
Beam, molded ft. in.	42	9
Depth, molded ft. in.	20	0
Load draft (Lakes) ft. in.	14	0
Gross tonnage	1694	
Net tonnage	974	
Propulsion, 3 engines, ... S. H. P.	750	

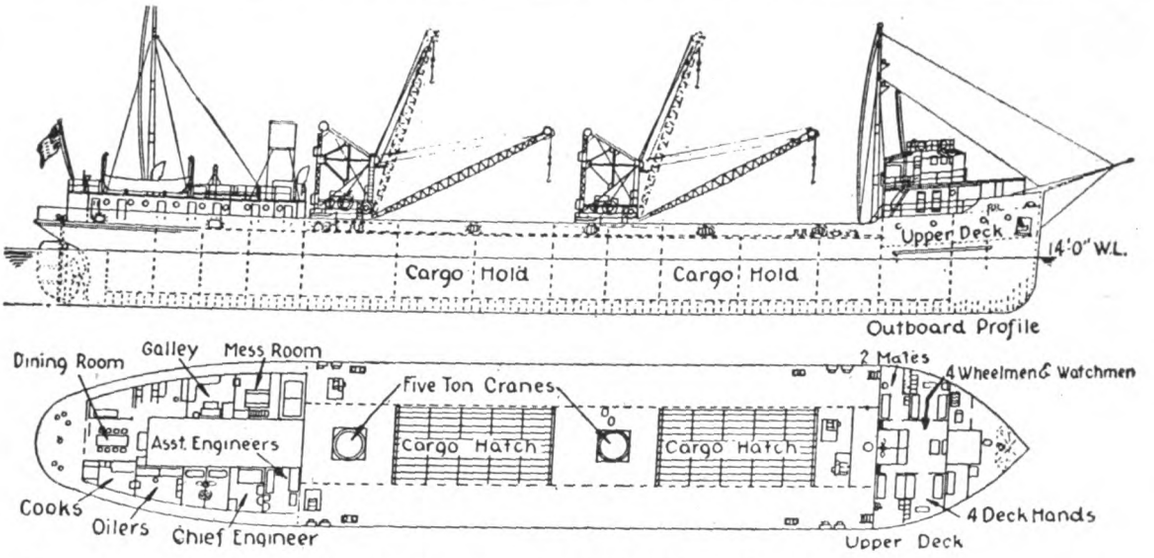
The STEEL ELECTRICIAN and her sister ships were designed and built by the Federal Shipbuilding & Drydock Co., Kearny, N. J. For the STEEL ELECTRICIAN, the owners and builders chose three 300-horsepower, 225 revolution per minute, 4-cyclinder, 4-cycle, airless injection main diesel engines of the new M. A. N. type as manufactured by the New London Ship & Engine Co., Groton, Conn., and complete electrical propulsion equipment and underdeck auxiliary motors and control built by the Westinghouse Electric & Mfg. Co. Each main engine drives a 205-kilowatt, 230-volt, main generator and a 30-kilowatt, 230-volt exciter. The main generators furnish power to the 750-horsepower, 690-volt, 135 revolutions per minute, single unit propulsion motor. Each engine, generator and exciter is mounted on a cast base, and a heavy-duty pedestal bearing is fitted between the generator and exciter, with the exciter armature overhung. This arrangement makes a very compact unit and one which is easily handled, in installation.

The three generating sets are arranged abreast of each other with the center set moved forward slightly to make room for the propulsion motor. The switchboard is located on a platform directly above the motor, thus affording the switchboard attendant a complete view of all the main machinery. As will be seen from the accompanying illustrations, this gives a very spacious and clean

The author, H. C. Coleman is a member of the staff of the marine engineering department of the Westinghouse Electric & Mfg. Co., Pittsburgh.



Diesel-electric cargo vessel STEEL ELECTRICIAN owned and operated by the United States Steel Products Co. between St. Lawrence ports and Chicago, Toledo and occasionally other ports on Lake Erie



OUTBOARD PROFILE AND DECK PLAN OF THE STEEL ELECTRICIAN

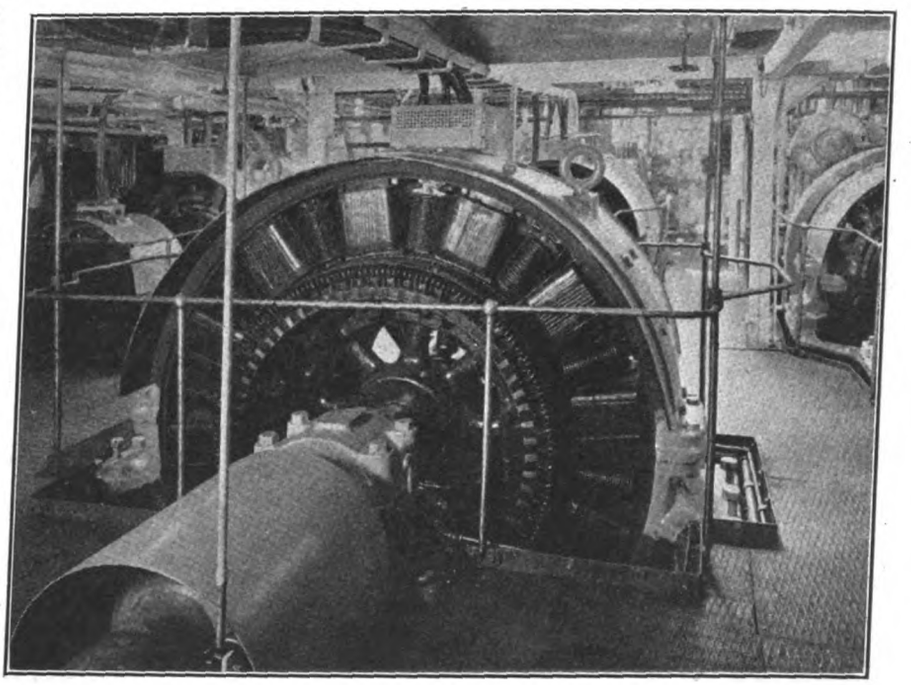
cut engine room with easy access to all parts of the machinery.

The main generators, exciters, and propelling motor are of the open, self-ventilated type, but are fitted with sheet steel covers to protect from dripping or mechanical injury. The main generators and propelling motor are straight shunt wound machines, connected in series and arranged for the full voltage control system, which the Westinghouse company has used on the vessels it has equipped with diesel-electric drive. A very simple potentiometer type rheostat is used for varying the generator field excitation in 50 steps from zero to full value in either direction. The motor field is excited at constant value and in one direction.

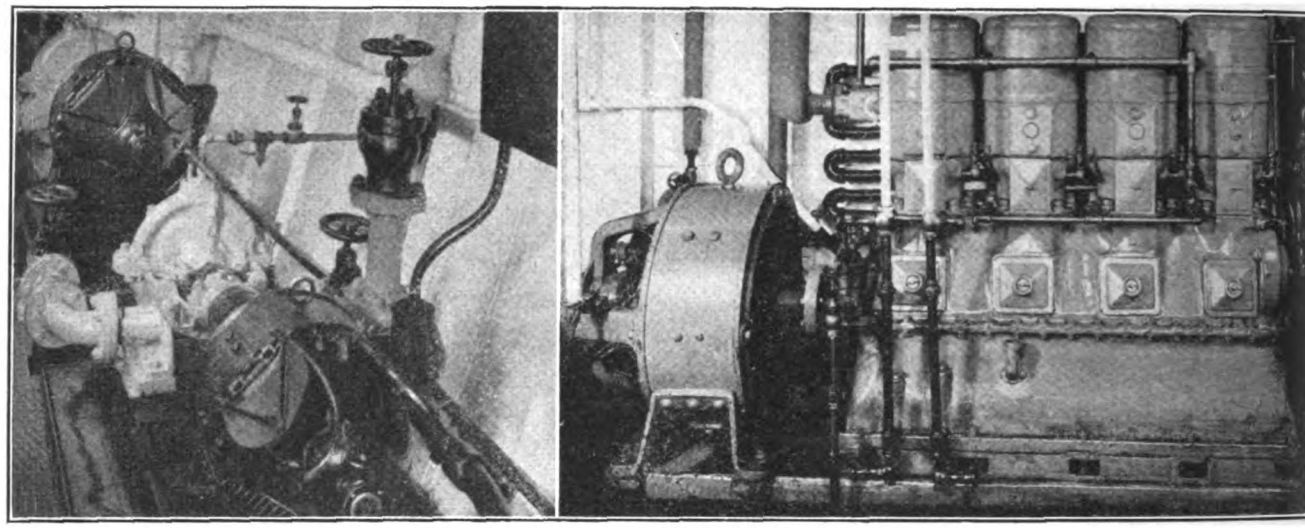
Under this condition, a variation in the generator excitation will produce a like variation in the motor speed, and hence the propeller speed. Complete control of the propeller is, therefore, effected from the pilot house by handling only the small field current of the generators and without opening a circuit of any kind. The potentiometer rheostat is mounted just beneath the pilot house floor and is operated, through bevel gears and shafting from a control pedestal, similar to a standard engine room telegraph stand, located in the pilot house alongside the steering control stand. A duplicate control station is provided at the switchboard in the engine room for emergency use. Complete control may be instantly transferred from one station to the other by manipulation of a switch on the main switchboard.

As shown in the accompanying illustrations, the main switchboard is arranged in six panels. The three panels on the port side control the connection set-ups for the main generators, and are of the complete dead-front type. Each generator is provided with a 3-position switch, manually operated by means of a hand wheel on the front of the panel. The hand wheel is provided with a notched disk so that the switch may be latched in any one of the three positions. Each latch handle carries an interlock which opens the excitation circuit to the generator and motor fields whenever the latch is disengaged from the notch, thus assuring that the main circuit is de-energized whenever switching operations are made.

One position of the switch connects the generator in the series propulsion circuit. The second position on the switch connects the generator to the auxiliary bus for supplying the cargo-handling machinery. The third posi-



PROPELLING MOTOR AND ENGINE ROOM LOOKING FORWARD ON THE STEEL ELECTRICIAN. A 750-HORSEPOWER AT 135 REVOLUTIONS PER MINUTE DIRECT CURRENT MOTOR—CURRENT FURNISHED BY THREE 300-HORSEPOWER EACH AT 225 REVOLUTIONS PER MINUTE DIESEL ENGINES



AUXILIARIES ON THE STEEL ELECTRICIAN—AT LEFT—CIRCULATING WATER PUMPS—AT RIGHT—ONE OF THE TWO 15-KILOWATT DIESEL ENGINE GENERATING SETS

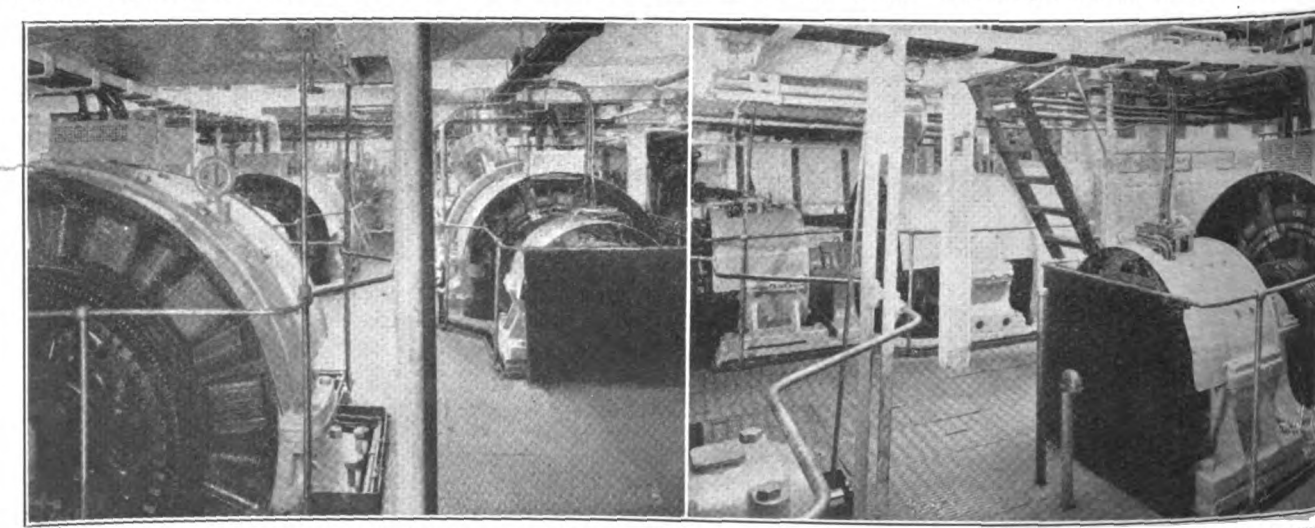
tion disconnects the generator from all active circuits and at the same time completes the series propulsion circuit for the remaining portion of the plant when set up for propulsion. The proper field circuit connections are also effected by the set-up switch in the various positions. An interlock is also provided to prevent connecting more than one generator to the auxiliary bus simultaneously. The hand wheel at the top of the center panel of the dead-front propulsion group operates the engine room potentiometer rheostat for emergency control of the propeller. The switch handle at the bottom of the same panel connects the control to either the pilot house potentiometer rheostat, or to the one in the engine room.

From the above, it is obvious that the control is arranged so that any combination of main generators may be used for propulsion. Also the voltage control system as installed, makes it possible to utilize the full engine capacity of any number of sets in operation. Thus, with two of the three generating sets in operation, there is sufficient power to drive the vessel at 88 per cent speed, while one of the generating sets will furnish sufficient power to drive the vessel at 70 per cent speed. This makes an exceedingly flexible propulsion plant.

The ability to use any one of the main generators for supplying power to the cargo handling machinery is another important point in the flexibility of the system. The STEEL ELECTRICIAN, therefore, carries only a small auxiliary oil engine generator set of 15-kilowatt capacity which is used chiefly when the vessel is laid up.

The STEEL ELECTRICIAN is the first vessel to be fitted with an automatic power limit control. The function of this part of the equipment is to limit the power developed by the engines to a predetermined value in order to prevent detrimental overload. The power limit control operates in such a manner as not to interfere in any way with the maneuvering of the vessel.

The arrangement for connecting the three exciters to the busses consists of three hand wheel operated cam contractor switch groups, these groups being mounted back of the fourth panel of the main switchboard from the port side, and operated from hand wheels on the front. Each group provides for connecting that particular bus to any one of the exciters. The system is such as to prevent paralleling the exciters. This provides complete flexibility of the auxiliary plant in a simple yet fool-proof arrangement. The engine room auxiliary feeder switches are made double-throw connecting to either of two of the auxiliary power busses, so that it is possible to divide the auxiliary load, when under way, between the three exciters. This makes it possible to utilize the full capacity of the three exciters when necessary, and also makes it possible to equalize the auxiliary load on the main engines.



ENGINE ROOM OF THE STEEL ELECTRICIAN—AT LEFT LOOKING FORWARD, SHOWING ARRANGEMENT OF MAIN GENERATING SETS AND PROPELLING MOTOR—AT RIGHT—LOOKING TOWARD PORT SIDE, SHOWING ONE OF THE THREE MAIN DIESEL ENGINES CONNECTED TO GENERATOR AND EXCITER

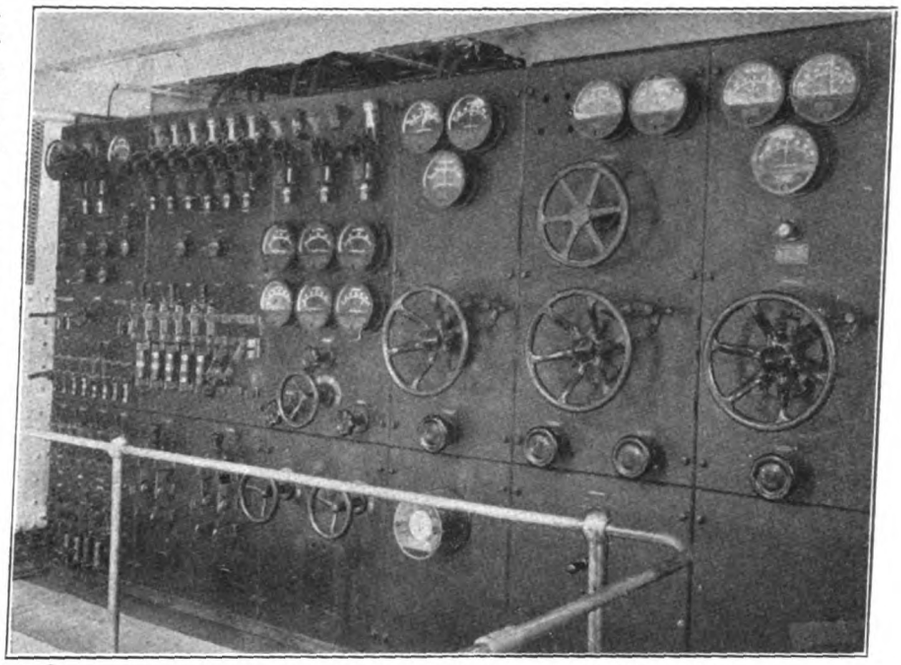
In order to provide for the 115-volt lighting bus, radio, etc., there are provided two motor-generator sets, each consisting of a 7-kilowatt, 125-volt generator driven by a 14-horsepower, 230-volt motor. Normally one of these sets provides sufficient power, thus leaving one unit for a spare. These sets are controlled so that power may be taken from the auxiliary power busses in such a way that the 115-volt circuits may be energized, regardless of the source of power on the auxiliary busses.

All of the underdeck auxiliary motors are of the latest drip-proof, self-ventilated, marine type. The controllers are both of the magnetic contractor and hand-starting and speed-regulating types, all enclosed in marine type, drip-proof cabinets.

It has been found that one of the chief advantages of the STEEL ELECTRICIAN is the flexibility and positive control available with the full voltage control system operated from the pilot house. This system affords the highest refinement of control, and at the same time utilizes the simplest arrangement of apparatus and of electrical circuits. An indication of the refinement of control is shown by the fact that on the STEEL ELECTRICIAN, the speed of the propeller may be varied directly from the pilot house in 50 progressive steps of less than 3 revolutions per minute each from the "stop" position to full speed of 135 revolutions. This range of control is, of course, available, either ahead or astern. The ability to regulate the speed directly from the pilot house in such small increments and over the entire range affords a marked improvement in operation. This will readily show why the STEEL ELECTRICIAN during her past season's operation has made such good time through the canal and other restricted places.

The captain of the STEEL ELECTRICIAN operates the vessel in a manner similar to a driver operating an automobile. There is no guessing or waiting for signals to the engine room to be executed. The fact that the captain controls the vessel himself eliminates most of the hazard of navigating the canal locks and restricted places. This feature is an important factor in reducing the chances for damage to both the vessel and the locks.

The growing popularity of this type of drive is evidenced by the fact that there are now diesel-electric yachts, trawlers, tugs of all kinds, ferryboats, fireboats, sea-going and other types of dredges, sternwheel river boats, tankers, coast guard cutters, and ocean-going cargo vessels. Up to the present time, there has been installed (or contracted for) in this country a total of seventy-two diesel-electric propulsion plants, ranging in size from 60 to 3200 shaft horsepower, with a total shaft horsepower of 52,105. These figures indicate that electricity has quickly become an important factor in the field of ship propulsion, as it has in every other field of application when once introduced.



MAIN CONTROL PANEL ON THE STEEL ELECTRICIAN

Coast Guard Cutters

Sealed bids in triplicate will be received until 2 p. m., June 21, for the construction and equipment of five United States coast guard cutters Nos. 45, 46, 47, 48 and 49, with the following characteristics:

Hull of steel construction.

Length overall ft. in..... 250 0
Beam, molded, ft. in..... 42 0
Displacement at 15 ft. tons....2075
Turbo-electric drive, single screw:
Shaft horsepower 3000

Three vessels must be completed on or before Oct. 31, 1928. Two vessels must be completed on or before May 31, 1929.

For the first three vessels appropriations cover the total cost and the shipbuilder may build the vessels as rapidly as he desires. For the last two vessels appropriations cover a total expenditure of about $650,000 during the period July 1, 1927 to June 30, 1928, and the shipbuilder must arrange his building program for these two vessels to limit payment vouchers made within said period within that total sum.

Specifications and drawings for the vessels may be obtained by shipbuilding companies from the commandant, United States coast guard, treasury department, Fourteenth and E. streets, N. W., Washington. D. C.

For the first three vessels Westinghouse propelling machinery and miscellaneous electrical equipment will be furnished by the government. For the last two vessels, contract for the machinery to be furnished by the government will not be awarded until after July 1, 1927. Bidders for the vessels must make a bid for each vessel provided Westinghouse machinery and miscellaneous electrical equipment is installed in all vessels and an alternative bid for each vessel provided Westinghouse machinery and equipment is installed in the first three vessels and machinery and equipment similar but of another manufacture is installed in the last two vessels. For all five vessels the boilers, boiler room equipment and other auxiliaries to be furnished by the government will be similar.

The Prince line motorship JAPANESE PRINCE, which sailed from New York March 22, arrived at Manila May 8, after having made an exceptionally fast run to her ports of discharge, from New York to Yokohama, in 33 days, to Kobe, 36 days, to Shanghaid 41 days, to Hong Kong 45 days and to Manila 47 days. There seems to be a constantly growing demand for faster cargo liners and higher rates can be obtained for greater speed.

Lake Shipyards Busy

By A. H. Jansson, Editor, Marine Review

THERE is marked increase in activity in the ship yards of the Great Lakes over that which prevailed a year ago, as noted during visits then and again early in May which the editor of MARINE REVIEW made to these yards.

Toledo Shipbuilding Co. Inc.

The Toledo Shipbuilding yard has not been so busy as it is now for several years. A year ago the working force consisted of approximately 315 men while now over 900 men are employed. There is under construction, launched on March 19, the carferry WABASH, said to be the largest vessel of its type in the world. This vessel is 380 feet in length overall, 57 feet 6 inches in beam and 21 feet 6 inches in depth. She is elaborately outfitted with machinery and with accommodations. She will be propelled by two vertical triple expansion steam engines with steam furnished by four scotch boilers. Car tracks have been laid in this ferry to accommodate thirty 42-foot railroad cars. Accommodations for crew and passengers are most complete and elaborate including restaurant and ice box.

A 600-foot bulk freighter for the Pittsburgh Steamship Co. is also underway. This vessel is 604 feet long; 60 feet in breadth and 32 feet in depth. She will be propelled by a triple expansion steam engine with steam furnished by three boilers of scotch type. A full line of auxiliary equipment will be used including windlass, winches, steering engine, pumps, refrigerating machinery and electric generators. This vessel is expected to be launched about the middle of June.

Besides the new work there has been a constant demand for repairs to Lake vessels, of all types. At the time, the steamship VENUS of the Pickands, Mather Co. was at the yard for an elaborate reconstruction to fit her for the general steel and scrap carrying trade. Her new equipment will include a powerful magnetic hoist.

Great Lakes Engineering Works

This yard has had a steady and fair amount of general repair work throughout the winter and early spring.

A new 600-foot bulk freighter for the Pittsburgh Steamship Co. and a sister vessel to the one referred to above at Toledo, was nearing completion. Delivery to the owner was made on May 17. Contract for this vessel was received last fall. This new bulk freighter is named the A. F. HARVEY, for the president of the Pittsburgh Steamship Co. She was launched on April 9. Both expeditious and excellent workmanship was demonstrated by the yard in the building of this vessel.

There is also building a self-unloading cement boat for the Huron Transportation Co. similar in general features to the JOHN W. BOARDMAN. This vessel is to have for power a triple expansion reciprocating engine of approximately 2000-horsepower supplied by steam from scotch boilers burning coal. She is 400 feet long by 60 feet wide by 29 feet deep and will have a capacity of about 6000 long tons. Her unloading machinery will be driven by electric motors, current for which is generated by two turbo sets. Many special and some patented features will be used in her conveying and unloading machinery

Owing to the nature of her service this vessel, would have been in the opinion of many engineers particularly suitable for the application of turbo-electric or diesel-electric propulsion machinery. Early in May she was nearly completely framed and largely plated and launching will probably take place early in July. A number of lake vessels of different types from old wooden ships to the latest bulk freighter like the WILLIAM G. MATHER were in for repairs or improvements of more or less extended nature. The general feeling at the yard was one of optimism in the prevailing present conditions and for future work.

Manitowoc Shipbuilding Corp.

This yard was particularly active and has been so for the past two or three years. A feeling of optimism prevailed in regard to present work and future possibilities. Besides a constant and important amount of general repair work there is new construction under way or contracted for.

A large dredge was recently launched named the NEW JERSEY for the Great Lakes Dredge and Dock Co. This vessel though not self-propelled is an elaborate shipbuilding job of heavy structural scantlings. She is 242 feet in length and approximately 51 feet in beam. The NEW JERSEY is of the hydraulic type and the powerful 30-inch suction centrifugal pump will be electric driven. Electric current will be furnished by four 1150-horsepower 6-cylinder Busch Sulzer diesel engines of cross-head type similar in design to the 3000-horsepower shipping board engines but of higher speed suitable for generator drive. These four units will be each separately connected to generators to furnish power required for the operation of the dredge.

It is said that this dredge will be the largest hydraulic dredge in the world exceeding in capacity the CLACKAMAS of the Port of Portland. Over 50 men will be accommodated in crew quarters on board and correspondingly elaborate accommodations are necessary, the entire upper deck being used for this purpose. It is said that the total cost of this dredge complete will be approximately $1,500,000. It will probably be a matter of two months or more before she is completed.

There is also under construction on the ways, two large sized derrick barges for the Great Lakes Dredge and Dock Co. These barges are not self-propelled but are of substantial construction and involve the fitting of large capacity derricks.

An order had also been received from the Pere Marquette railroad for a carferry, 400 feet in length, and 53 feet in beam. This ferry will be double ended and the machinery will be of the usual reciprocating steam engine type with scotch boilers. A vessel of this nature is also a considerable shipbuilding job and involves the expenditure of approximately $800,000.

The present and future prospects for work in this ship yard seem quite satisfactory. During 1926 the yard had under construction in some stage the following vessels: The DANIEL MCCOOL, a twin screw diesel engined, self-unloading cement boat; the GRAND RAPIDS and MADISON, two carferries for the Grand Trunk railroad for use on Lake Michigan; also the carferry MANITOWOC for the Wabash Railroad Co. and the powerful diesel engine tug WILLIAM A. LYDON for the Great Lakes Dredge and Dock Co. This indicates that the Manitowoc Shipbuilding Corp. is now, and has been for some time, particularly active in shipbuilding and repairs.

American Shipbuilding Co.

The Lorain, O., yard of the Amer-

ican Ship Building Co. was inspected on an earlier trip. Of all the ship yards on the Great Lakes the American Ship Building Co. is, of course, much the largest in capacity and it has had the lion's share of the large amount of new shipbuilding placed. The following 600-foot and over, Great Lakes bulk freighters under construction at the Lorain yard were delivered this spring: WILLIAM MCLAUCHLAN and ROBERT HOBSON for the Interlake Steamship Co., Cleveland; the GEORGE M. HUMPHREY for the Kinsman Transit Co., Cleveland; and the L. E. BLOCK for the Inland Steamship Co., Chicago. The machinery on all four vessels is of triple expansion reciprocating type and steam is furnished in the case of the first two by three water-tube boilers in each vessel and in the case of the last two by three scotch boilers in each vessel. The first three vessels are also fitted with condensers of the surface type. Each vessel is equipped with a complete line of auxiliaries such as windlass, winches, steering gear, pumps, refrigerating machinery and electric generators.

There was launched at the Lorain yard on April 9, the longest vessel (638 feet overall) ever constructed on the Great Lakes, the CARL D. BRADLEY, a self-unloading boat, suitable for the stone trade, built for the Bradley Transportation Co., Rogers City, Mich. This vessel owing to its peculiar service of unloading itself is fitted with a main turbo-electric unit of a maximum 4800-horsepower. Electricity generated by the main turbine will be used in driving the propeller by means of a single motor and when unloading it will be used for driving the electric motors for the elaborate conveying and unloading gear. It is expected that the CARL D. BRADLEY will be completed early in July. She is an elaborate shipbuilding job and the cost involved is high.

On April 30, the largest lake bulk freighter the HARRY COULBY building for the Interlake Steamship Co. Cleveland was launched at the Lorain yard. This vessel has the distinction of being the largest ore and coal carrier ever constructed in an Amercian ship yard on the Great Lakes. It is possible that the Canadian steamer LEMOYNE exceeds her slightly in capacity. The HARRY COULBY is 630 feet 9 inches overall and 65-foot beam with a molded depth of 33 feet. The main engine is of the triple expansion type and steam is furnished by three water-tube boilers to operate at 215 pounds pressure.

The Standard Oil Co. of New York recently placed two non-self propelled oil barges with the American Ship Building Co. These barges it is understood will be of full barge canal size, and are now under construction.

It is also reported on good authority that an order has been given to the American Shipbuilding Co. for the building of an oil tanker for the Standard Oil Co. of Indiana. This tanker it is expected will be propelled by a reciprocating steam engine and will be similar to the tanker RENOWN which was also built by the same company. She will be used for the carriage of lighter oils on the Great Lakes from the distributing point of the Standard Oil Co. at Whiting, Ind. She will be 390 feet in length, 52 feet wide and will be 25 feet deep. The capacity will be about 2,000,000 gallons. This tanker will be equipped with a complete line of pumps and auxiliaries.

New Types of Propulsion

The foregoing shows that there is much more activity in shipbuilding than a year ago. There are also indications that the constant drive toward greater economy in operation will make smaller ships, which now constitute the great bulk of shipping on the Great Lakes, obsolete and it will be necessary to continue replacements with larger modern units. It is possible that in this drive toward efficiency a type of power more economical than that commonly used will come into its own. If this is tried out and proves successful the passing of the reciprocating steam engine with hand fired coal burning scotch boilers will be inevitable. The choice for new types of power might reasonably lie between the diesel engine and steam turbine reduction gears with perfected pulverized coal firing and water tube boilers.

Part of the blame for lack of progress in the adoption of new types of power on the Great Lakes might be laid to the lack of preparation in the way of acquaintance with existing operating problems on the part of engineers of companies wishing to replace with their equipment the old equipment. In asking, R. H. Reynolds, marine superintendent of the Ann Arbor and Wabash railroads, if he had considered a different type of power than that which is being installed on their carferries he replied that he was entirely open and receptive to a carefully worked out proposal but that so far no one competent to prepare such a proposal has taken sufficient interest to observe the severe kind of operating conditions under which these ferries serve. Consequently when the time came to order this equipment a new proposal tending to alter the usual type of machinery was considered too hastily gotten up and could not be taken seriously.

Bids for steel has been asked for recently on three new lake steamers. Two of these are of the large 600-foot bulk freighter type for the Pittsburgh Steamship Co. and the third is reputed to be a smaller ship for other interests. Several tentative proposals are also under consideration.

Build Oil-Electric Tugs at Panama

THE tugs CHAGRES and TRINIDAD shown in the accompanying illustration, under construction by the mechanical division of the Panama Canal on the top side of the dry dock at Balloa, C. Z., were to be "launched" during the latter half of May. Launching in this case means that each tug is bodily lifted off the side wall of the dry dock by the canal's two 250-ton floating cranes AJAX and HERCULES.

They are all-steel diesel electric towboats, 125 feet long, 28-foot beam, and approximately 14½-foot deep and are each of 750 shaft horsepower. These tow-boats have been designed primarily as seagoing craft, although the major part of their duty will be, no doubt, in Canal Zone waters.

Living accommodations are provided for 6 "gold" or American men and 24 "silver" or tropical employees. One tug, for the present, is being equipped with the latest radio equipment. Each boat is being equipped with very powerful electric towing machines, equivalent in capacity and size to that of the largest steam tugs.

Two definite steps in advance of towboat design have been included in these hulls. The first of these is the installation of bulkheads and double bottoms as necessary, in order to make the tug a one compartment ship; that is to say, it will be possible for the tug to remain afloat with one of her main compartments bilged. The second change in design is the cutting away of the deadwood aft and installing a simple casting in its place. This is expected to greatly improve

THE OIL-ELECTRIC TUGS CHAGRES AND TRINIDAD BUILDING BY THE PANAMA CANAL ON THE TOP SIDE OF THE GREAT 1000-FOOT DRYDOCK AT BALBOA, C. Z. SHOPS WITH COMPLETE SHIP REPAIR EQUIPMENT ARE SHOWN IN THE BACKGROUND

the handling qualities of these large tugs. It is probable that, regardless of the length they will be just as handy as are the smaller harbor tugs now employed on the canal.

The main propelling machinery was purchased in the United States, for delivery on the Canal Zone not later than May 1, 1927. Each tug is fitted with two 4-cycle mechanical injection diesel engines, of Ingersoll-Rand make, each driving a direct-connected 330-kilowatt, direct-current 250-volt generator and on an extension shaft a 50-kilowatt direct-current exciter. The two main generators, operating in series, drive a double armature 750-horsepower direct-current motor. The electrical equipment was furnished by the General Electric Co. The motor is direct-connected to a single propeller approximately 10 feet 6 inches in diameter, designed to turn from 115 to 140 revolutions per minute when developing full power. All auxiliaries are driven from the power developed by the two exciters when the main engines are in operation.

As auxiliary power each tug is equipped with a 10-kilowatt generator, driven by a direct-connected 25-horsepower 4-cycle solid injection diesel engine. An air compressor of suitable size can be driven on an extension of the auxiliary generator shaft through a clutch. An independent compressor, motor-driven, will be installed in each boat. The motor for this compressor is to be automatically controlled from the air pressure in the starting air tanks of the main engines, which will insure continuously maximum pressure for the starting air.

Each tug equipped with a motor-driven centrifugal fire pump the capacity of which is 1000 gallons per minute at 100 pounds pressure. The tugs have been equipped so that this pump may be used as a salvage pump as well. Lighting circuit and power for the ice machine motor and sanitary pump motor are taken from 125-volt mains. This voltage is obtained by stepping down exciter voltage through a motor generator. Each tug is equipped with a second motor generator which will convert the 25-cycle 230-volt current Canal Zone to 125-volt direct current, for use on the tugs. This will permit the tugs, while lying at dock, to enjoy the comforts of lights, sanitary system, and refrigeration without running any machinery aboard the tug.

The fuel oil capacity of each tug is sufficient to give at least 21 days' cruising radius operating at full power. The names given the tugs, CHAGRES and TRINIDAD come from the two rivers which are the principal tributaries of Gatun lake.

The photograph used to illustrate this article, and certain interesting particulars, and the Panama Canal Record, from which most of the text is taken, were sent to the editor of MARINE REVIEW by C. A. Mc Ilvaine, executive secretary, the Panama Canal.

The shipping board motorship William Penn, operated by the Barber line for the past four years, has been allocated to the Roosevelt Steamship line for operation in the Australian and Indian trade. The Roosevelt line has six other motorships in this service, the TAMPA, UNICOI, WEST HONAKER, WEST CUSSETA, SAWOKLA and CITY OF RAYVILLE.

Fast Diesel Freighters for Kerr Line

The new 16-knot motorships being built, in England for the Kerr line around-the-world service, the first of which, the SILVERGUAVA, is to come out in July, are to have refrigerator space for 1500 tons of cargo. This has been provided primarily for carrying California products to the Orient, according to H. S. Scott, president of the General Steamship Corp., Pacific coast agent for the line. The around-the-world service will be maintained by the SILVERGUAVA, SILVERMAPLE, SILVERHAZEL, SILVERASH, SILVERBEECH and SILVERBELLE. Each has a capacity of 9500 tons deadweight and a normal speed of 14½ knots, which can be increased to 16 knots without pressure. They are driven by 6000 horsepower Doxford engines. Engine room and deck auxilaries are electrically driven.

Casualties to vessels of 500 tons gross register and upward during the month of March, according to returns compiled by the Liverpool Underwriters' association, were 15 total losses and 617 partial losses, as compared with 11 and 642, respectively, for the same month of 1926.

Apply Channel Steel System in Great Lakes Freighter

BY WILFORD G. BARTENFELD

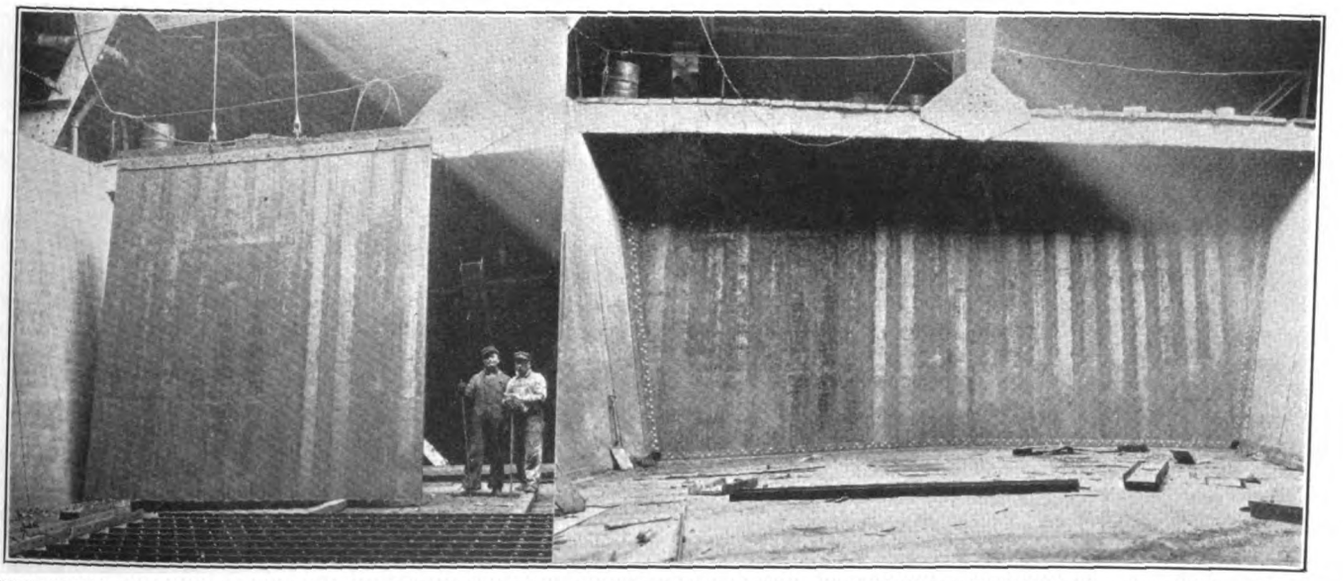
THE first application of the channel steel system of construction in large vessels, was made this spring, when the Pittsburgh Steamship Co., Cleveland, installed three channel steel cargo hold bulkheads, in the steamers JAMES J. HILL, RENSELLEAR and HARVARD. The work on the steamers JAMES J. HILL and RENSELLEAR was done by the Pennsylvania and Lake Erie Dock Co., at Fairport, O., and the work on HARVARD was done by the Pittsburgh and Conneaut Dock Co., Conneaut, O. These companies are subsidiaries of the United States Steel Corp., and during the winter months when the navigation season is closed on the lakes, they do considerable repair work on the vessels of the Pittsburgh Steamship Co., which owns and operates the largest fleet of vessels under the American flag.

The new channel bulkheads installed in these vessels are shown in the accompanying illustrations. They are set up on a slight angle and all are located about 18 feet aft of the collision bulkhead, and they serve to block off the cargo hold forward under the main deck, thus keeping the cargo back and within easy reach of the unloading rigs. The bottoms of the bulkheads are about 3 feet forward of the No. 1 hatch coaming and they will thus be subjected to considerable abuse from the unloading rigs.

The bulkheads are about 14 feet in height, 30 feet in width at the tank top, and 32 feet in width at the top. The top of the bulkhead is riveted to one of the main deck channel beams, by means of a 10-inch 20-pound plate. At the bottom and sides the bulkheads are connected to the tank top and side tanks with a bounding angle bar, in the usual manner. Twenty-five 15-inch 33.9-pound structural steel channels make up one bulkhead, and as the bulkhead is non-watertight the rivet pitch on the channel flanges is 6 inches between centers. No calking is used in the seams. On future work of this nature a rivet pitch of probably 9 inches will be used. The bulkheads have one athwartship stringer channel, with four channel braces bracketed to the channel flanges and to the stringer. This stringer is located about 6 feet above the tank top floor where the bulkhead is most liable to be struck by the unloading rigs. There are also a few bottom bracket plates spaced about 4 feet, connecting the channel flanges to the tank top plating. There is also a bracket connection to each side tank, at the ends of the channel stringer. There are no brackets at the top or side connections of the bulkheads.

In so far as the writer knows, these are the first installations in which there has been a complete elimination of frames and nearly a complete elimination of all rivets through the bulkhead surface. The only rivets penetrating the face of the bulkhead are at the bounding angles. Of course the channel flanges are the substitutes for the stiffening angle, and in comparison with an ordinary plate and angle construction, the channel bulkheads have about three times as many flanges as there would be angles in the plate construction, thus giving the bulkhead shell three times as much stiffness, as in the plate construction.

There were a number of unique features brought out in the fabrication and erection of these bulkheads. The Pennsylvania & Lake Erie Dock Co. drilled the flanges of the channels, rather than punching them. The channels were placed on their flanges and all grouped together. A templet for the spacing of the holes was laid down, and the flanges marked for drilling. The drill of vertical high-speed electric type furnished by the Van Dorn Electric Tool Co., Cleveland, was mounted on a two-wheel drill buggy, such as is used for countersinking and reaming in plate tank tops. This is a one-man rig, and all the flanges in the entire bulkhead were drilled in 2 days, that is in 16 hours labor by one man. If the channels had been punched, it would have required three men, to put the



INSTALLING CHANNEL STEEL BULKHEAD IN STEAMER RENSELLEAR OF THE PITTSBURGH STEAMSHIP CO.—AT LEFT— CHANNELS ASSEMBLED AND RIVETED TOGETHER IN TWO SECTIONS IN HOLD OF THE VESSEL—ONE SECTION BEING HOISTED INTO POSITION—AT RIGHT—COMPLETED BULKHEAD IN PLACE WITH BOUNDING ANGLES TO TANK TOP AND SIDE TANKS

material through the punch, and about as many if not more hours labor would have been required. An especially good job of course is obtained by drilling. It is undoubtedly true that drilling would not be as economical as punching in other kinds of work, and where multiple punches are available, but the fact remains that the drilling was done as cheaply as the punching could have been done in this instance, and it is food for thought in future channel construction work.

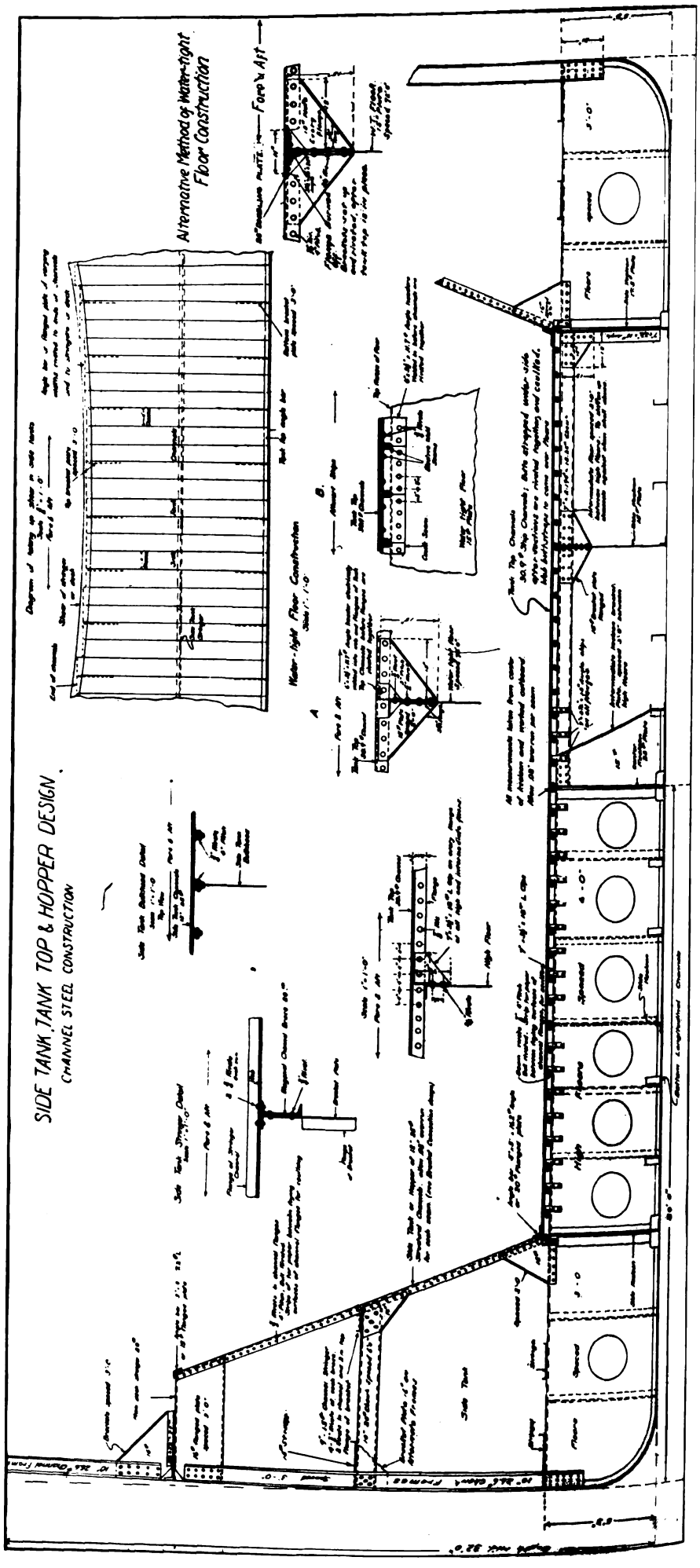
After fabrication, the channels were lowered through the hatch and were bolted and riveted up in two sections on the tank top of the vessel. The dock crane then lifted the two sections, comprising the bulkhead, into place. The bulkhead bounding angles were then put on, the bulkhead riveted up in place, and the bracing set up. Under this method, the use of the crane was only required for a small fraction of the time necessary with plate construction where every plate has to be hoisted in place.

The only countersinking required was in the side and bottom bounding angle bars. The channel flanges were riveted together with an ordinary pneumatic hammer. If a compression or bull riveting machine had been available, about 75 per cent of the bolting up could have been eliminated, but as the bulkheads were non-watertight and the key bolts were quickly set up, the method proved satisfactory.

Though this is the first actual application of channel construction to lake freighters, plans have been prepared for tank tops and side tanks. To the right on this page there is shown a cross section of a standard Great Lakes bulk freighter, with a length of 604 feet, a beam of 60 feet and a molded depth of 32 feet, and having the side tanks and tank top, laid out for a patented channel steel system of construction, which has been approved by the American Bureau of Shipping.

An analysis of the strength of the channel side tanks and tank top, and the present plate construction in the above mentioned ship has been made, and it shows that the permissible load per square foot for the channel construction is 3100 pounds per square foot while for the present plate construction the safe load per square foot is 2100 pounds. The permissible load of the plate side tank is about 600 pounds per square foot and that of the channel about 700 pounds per square foot.

The channel tank top is therefore approximately 50 per cent stronger than the present plate tank top, and



the channel side tank is 10 per cent stronger than the present side tank of plate construction.

In connection with the strength analysis, a careful check has been made of the weights involved in the two designs, and the riveting in each. The structures considered in each case were made up of parts as follows:

1. Plate side tanks; plating, frames, bounding angles, side tank and outer shell stringer plates, transverse channel braces, and bulkheads spaced 72 feet.

2. Plate tank top; plating, seam and butt straps, tank top angle stiffeners, center keelson top angles, tank top angle clips, tank top corner angle bars, and watertight floors spaced 72 feet.

3. Channel side tanks; side tank channels, brackets, transverse channel braces, side tank and outer shell stringers, bounding angles and bulkheads spaced 72 feet.

4. Channel tank top; tank top channels, extra height of center keelson 3½ inches, channel web butt straps, flange angle clips, intermediate floors with brackets, tank top corner angle bars, and the watertight floors spaced 72 feet.

A summary of the results obtained follows:

Weight, Material and Rivet Heads of two Side Tanks. Hold Length 438 Feet.

Plate construction	Channel design
233.69 net tons	241.06 net tons

Weight, Material and Rivet Heads of Tank Top. Hold Length 438 Feet.

Plate construction	Channel design
332.47 net tons	338.00 net tons

Riveting in two Side Tanks. 438 Feet of Hold Length

Plate construction

Countersunk	Non-Countersunk
41,026	8,176

Total 49,202

83½ per cent of total require countersinking.

Channel Construction

Countersunk	Non-Countersunk
13,942	49,640

Total 63,582

22 per cent of total require countersinking.

Riveting in Tank Top. 438 Feet of Hold Length

Plate construction

Countersunk	Non-Countersunk
67,489	14,417

Total 81,906

82 per cent of total require countersinking

Channel Construction

Countersunk	Non-Countersunk
10,420	68,036

Total 78,456

13 per cent of total require countersinking

From the foregoing data, we find that in a complete channel tank top and side tank construction, the following advantages are obtained over the plate construction:

1. An increase of 50 per cent in tank top strength, and 10 per cent in side tank strength.

2. Elimination of 84 per cent of the countersinking in the tank tops, and 61 per cent in the side tanks. This reduces in like proportion, the number of rivets which penetrate the hoppers, and which is one of the distinct advantages in the channel construction.

3. Elimination of 51 per cent of the present tank top calking, and 49 per cent of the present side tank calking.

4. Elimination of 60 per cent of the tank top butts, (72 feet channel lengths against 30 feet length plates). There are no butts in the channel side tanks.

5. Elimination of the fabricating and erection costs of all plate side tank frames. There are no side tank frames in the channel construction.

6. Elimination of about 60 per cent of the present bolting up costs, if the channel flanges are set up with a bull machine.

7. A complete elimination of the cost of planing the edges to tank top plates.

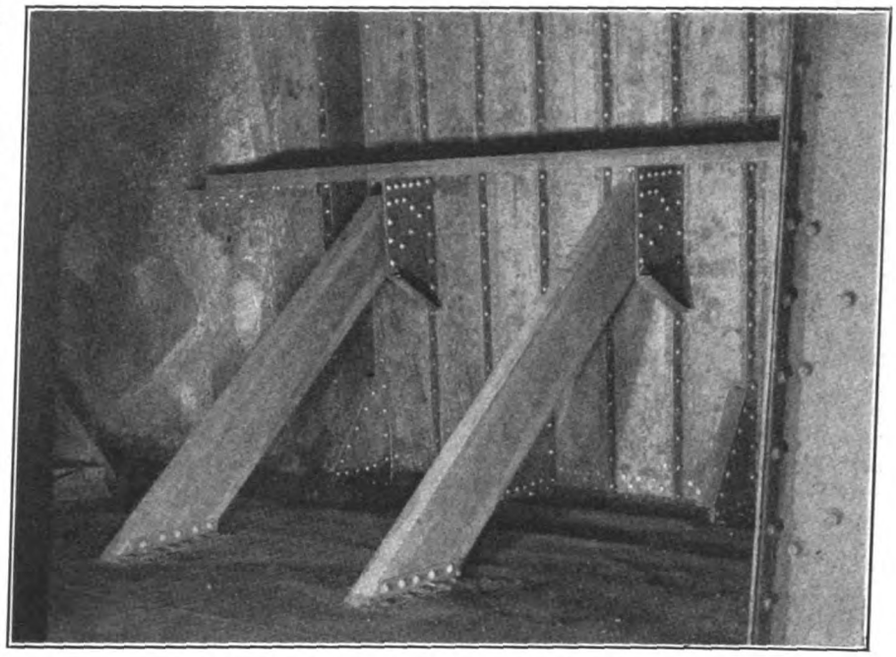
8. A considerable saving in erection costs should be effected, as the channels can be set up in large sections, rather than having to set up each plate separately.

9. Drilling or punching the flanges to any desired pitch, as it is all uniform work, can be done quickly, and so can the riveting. The actual cost of riveting compared with the plate construction should be less, in view of the fact that the most of the rivets, can be bull riveted, the little bolting up required, and the far less number required to be countersunk.

10. By the flanges of the tank top channels being brought to bear upon the top flanges of the floors, some of the direct shear on the flange rivets is relieved, and a further saving is effected by not having to cut out the floors to take the flanges, as is done in the plate design to allow the fore and aft tank top angles to pass through.

11. The complete channel design weighs 12.9 net tons more than the plate construction in the 438-foot hold length vessel for tank tops and side tanks. In fact no effort has been made to reduce the weight of the channel design, as the additional strength obtained by its use, is needed to meet clam shell abuse. Any additional deadweight capacity which might be gained through a reduction in weight in the hoppers of a lake ship, would mean extra expense in repairs. It is the tank tops and side tanks, which take the hardest usage in our lake ships.

12. The channel tank top has only half the amount of unsupported tank top area, and the side tanks only one third of the unsupported area, as compared with the plate construction, which will increase the buckling resistance and reduce the scalloping in the hopper shell. One of the main purposes in the channel construction is to throw as much of the weight and strength into the hopper shell as possible, to take abuse, and back it up with sufficient stiffening to make it stand up. In other words, additional weight is introduced where it is needed, without serious decrease in deadweight.



BACK OF NEWLY ERECTED CHANNEL STEEL BULKHEAD ON THE STEAMER JAMES J. HILL OF THE PITTSBURGH STEAMSHIP CO. SHOWING HORIZONTAL CHANNEL STIFFENER AND CHANNEL BRACING TO TANK TOP

Net income of Bush Terminal Co., and subsidiaries for the quarter ended March 31, 1927, was $450,080 after interest, depreciation, taxes, etc.

Convert Three Tankers to Diesel Electric

Diesel-electric machinery is now being installed in three tankers for the Atlantic Refining Co. These boats, were purchased last year from the shipping board.

The three vessels, the SHARON, J. M. CONNELLY and BESSEMER, each having a deadweight of 7000 tons, were originally steam driven and converted to diesel-electric, will be used in transatlantic service. The J. M. CONNELLY is being outfitted at the Point Breeze plant of the Atlantic Refining Co., Philadelphia, and will probably go into service by the latter part of June. The other two boats are being reconditioned by the Alabama Drydock & Shipbuilding Co., Mobile, Ala., and will probably be completed in August.

The power plants for each boat will consist of Ingersoll-Rand oil engines and electric equipment furnished by the General Electric Co. Each tanker will be equipped with three 850-horsepower, 225-revolution per-minute, oil engines, each driving a 525-kilowatt, 250-volt generator for propulsion and a 50-kilowatt, 250-volt auxiliary generator for excitation and ship's auxiliary power. The propulsion generators will supply power to an 1800-horsepower, 90-revolution-per-minute, 750-volt double armature motor on each boat, direct connected to the propeller shaft. The control will be of the Ward-Leonard type arranged for operation either from the pilot house or the engine room, the panels being of the dead-front type throughout.

The tankers will be fitted with electric auxiliaries, all of which will be driven by General Electric motors. These auxiliaries will include two 80-horsepower cargo pumps, one 45-horsepower windlass, one 30-horsepower mooring winch, one 30-horsepower fire and bilge pump, two 15-horsepower air compressors, a balancer set and numerous small pumps as well as a 25-kilowatt auxiliary generator driven by a small oil engine which will be used for emergency and in port.

Inspectors Wanted

Open competitive examinations are to be held for the positions of local and assistant inspector of boilers and local and assistant inspector of hulls.

Applications for these positions must be on file with the civil service commission at Washington, D. C., not later than June 11. Full information may be obtained from the civil service commission or from the secretary of United States civil service examiners at the postoffice or customs house in any city. The examinations are to fill vacancies in the steamboat inspection service, and in positions requiring similar qualifications. The entrance salary in the steamboat inspection service is $2700 a year.

Malolo Near Completion

At a recent meeting in San Francisco, E. D. Tenney, who has been president of the Matson Navigation Co., was elected chairman and William P. Roth, president. A. C. Diericx, formerly assistant manager, was appointed vice president.

The completion of the new Matson liner MALOLO is anticipated so that her first trip is scheduled from New York for San Francisco via Havana, Colon and Cristobal on July 7. She will arrive in San Francisco on July 22 and sails from there four days later for her first regular run to Honolulu. The commodore captain of the company, Capt. Peter Johnson, commander of the MAUI, will take command of the MALOLO.

An official trial trip of the new vessel built by Wm. Cramp & Sons Ship & Engine Building Co. under the supervision of William F. Gibbs, naval architect is to be held off Marblehead, Mass., during the ten days beginning May 25.

Contract to furnish 60,000 tons of fuel oil for the United States liner LEVIATHAN at Southampton during the year beginning May 1, has been awarded to the Anglo-Persian Oil Co. by the shipping board on the basis of 67s 6d per ton.

Naval Architects Meet

A summer meeting of the Institution of Naval Architects will be held at Cambridge university, Cambridge, England, on July 12-15. The president of the institution, His Grace the Duke of Northumberland, K. G., C. B. E., M. V. O., will preside and a reception will be accorded members by the vice chancellor of the university.

Besides reading of papers visits will be made to nearby engineering works and places of general interest including the historic colleges of the university. The banquet of the institution will be held on the evening of July 14 in the hall of Trinity college.

Lloyd Sabaudo Earnings Increase 50 per cent.

The annual report of the Lloyd Sabaudo, operating lines between Italy and New York, South America and Australia recently received, shows a growth in business and earnings of 50 per cent over the previous year. After payment of all charges, provision was made for a 10 per cent dividend on the 150,000,000 lire capital stock. Full interest charges are shown as having been earned over four times.

A comparison of balance sheets for 1925 and 1926 indicates that there was charged off during the year approximately 10 per cent of the 1925 value of the company's fleet. The company in 1926 started construction of a sister ship to the popular CONTE BIANCAMANO, which started in service on the New York-Genoa run at the end of 1925. This new vessel, the CONTE GRANDE, is slightly larger than the CONTE BIANCAMANO.

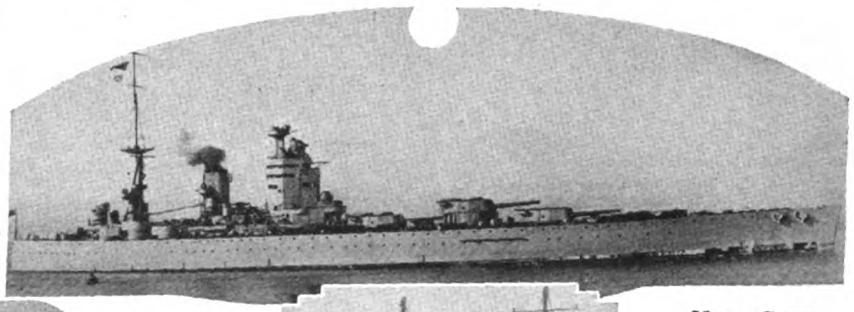
City of Rayville Trial

Sea trials of the converted shipping board motorship CITY OF RAYVILLE were held April 27 off Hampton roads. The conversion using a Busch-Sulzer diesel engine was carried out by the Newport News Shipbuilding & Drydock Co. She is of the usual three island type freight ship of 416 feet length between perpendiculars, 54 feet beam, with a deadweight capacity of 9125 tons on a draft of 26 feet 10¾ inches. There are accommodations for 15 passengers. The fuel capacity is 760 tons and normal speed is 11.6 knots.

The main engine is a Busch-Sulzer, six-cylinder, single-acting, two-cycle, air-injection unit of 3000 brake horsepower at 90 revolutions per minute. Auxiliaries are of the Worthington single-acting, two-cycle, air-injection type. The propeller is of the four-blade, built-up type, with a diameter of 17 feet 9 inches and a pitch of 14 feet. Pumps, winches and windlass are electrically operated.

The cost of the conversion is as follows: Installation, $227,150; special alterations, $132,800; main engine, including spare, $247,330; deck machinery, including steering gear motors, control and cable, $29,320; engine-room auxiliaries, including engines, generators, pumps, coolers, switchboard and cable, $94,000; repairs, $26,000; equipment and outfit, $25,000; engineering, purchasing, inspection, traveling, freight, extras, trial trip and incidentals, $38,000. Total, $819,600.

Latest Marine Events in Pictures

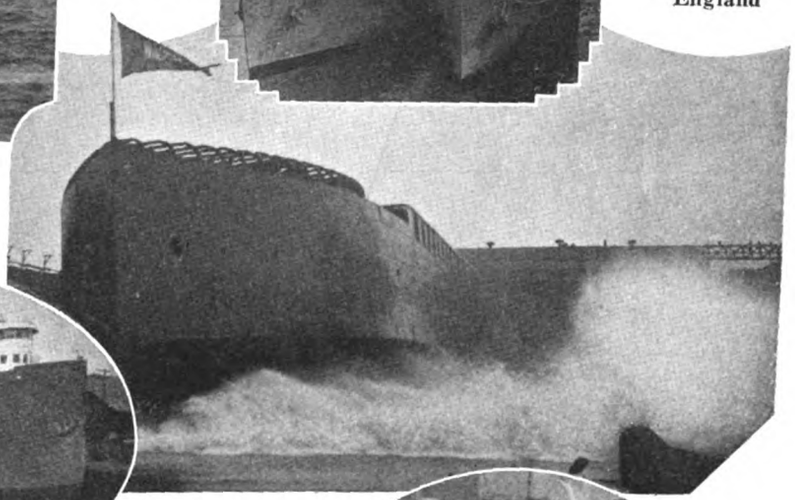


At Right—H. M. S. Nelson, first British post war battleship; of 35,000 tons, and is said to be the world's most powerful warship. She is shown entering Portsmouth harbor, England. A peculiarity of her construction is her exceptionally long forecastle

Life boat drill on the S. S. Republic in mid-ocean. For comfort and appointments the Republic is one of the finest vessels of the United States lines

Carferry Wabash taking the water at the launching March 19

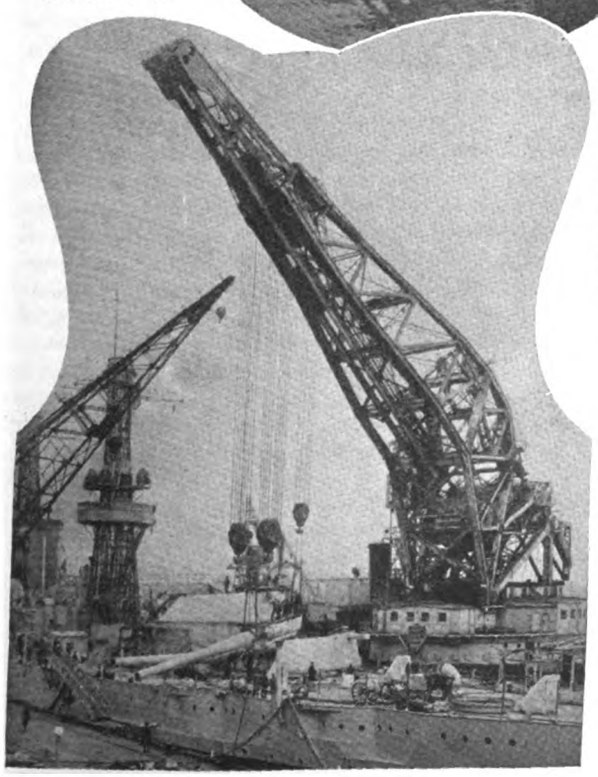
New Coast Guard patrol boats built by American Brown Boveri Electric Corp. now in service off New England



Steamer Sonora at Cleveland. Broke all records in March by transporting automobiles from Detroit to Cleveland, being the first boat to open navigation in 1927

Goodrich Transit Liner, Alabama at Municipal pier, Chicago

Gun crew training anti-aircraft gun on new Coast Guard boats

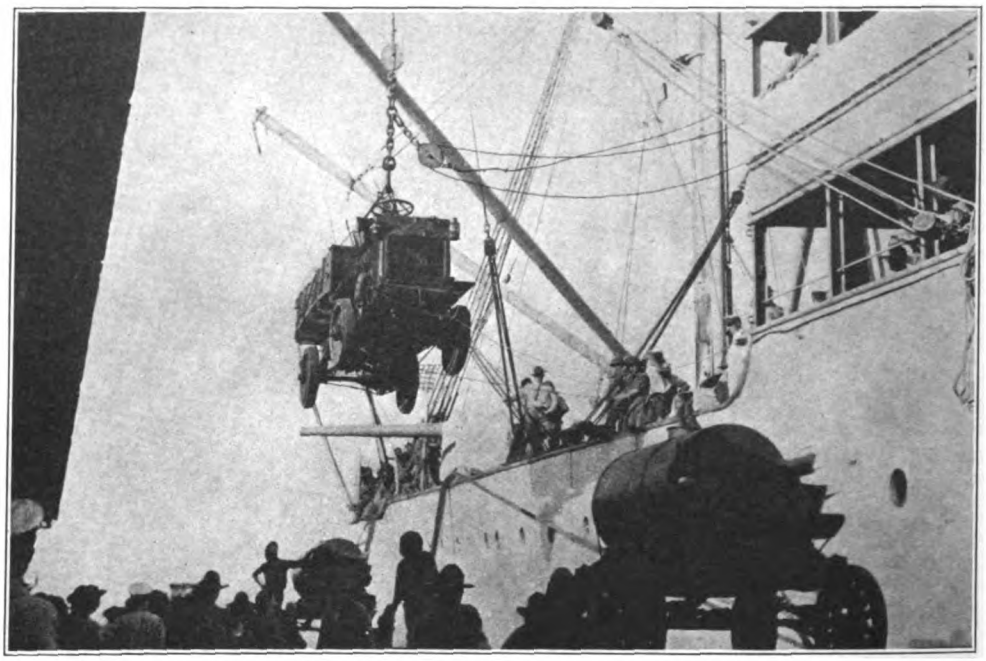


Navy crane ship Kearsage lifting 16-guns and casings out of turrets on the Idaho. These guns are to be relined and this 250-ton floating crane will be used for reinstalling them

An officer of the S. S. Republic greets a strange visitor. This huge fish is of a rare species known as Mola Mola. The photograph was taken by Captain Randall

Dock Management Progress Section

How Successful Dock Operators Have Met Problems of Giving Best Service to Ships



Unloading trucks—U. S. S. HENDERSON at Corinto, Nicaragua. Photo courtesy Four Wheel Drive Auto Co.

Cut Cost of Cargo Handling at the Port of New York

BY JAMES A. JACKSON

IN COLLECTING data for this paper many conferences were held with representatives of large transportation companies to obtain their views, and the statements made by two men who hold positions of responsibility in two different companies are sufficiently interesting to be repeated. The author may not use their exact words, but in substance the first one said: "The port of New York is still handling its freght as it did fifty years ago." The second one said: "The port of New York is handling its freight as satisfactory and probably as economically as any port in the country."

There is perhaps some truth in both statements, and the whole truth probably falls somewhere between the two. However, to anyone who has studied the situation carefully the fact cannot be overlooked that New York has made and is continuing to make pronounced progress in its methods of handling material and that the speed of this progress, which in the last analysis is going to be governed by economic conditions, is no doubt being made about as fast as these economic conditions will permit. In other words, to convert the port of New York from what it was to what it ought to be must be by evolution and cannot be by revolution. Never in the history of our country has more attention been given to the development and introduction of more efficient methods in industry than at the present time, and material handling is one branch of our industry. Never before has money been spent any more freely for new facilities to speed up production and reduce costs than it is being spent today. The principal controlling factor of the rate at which money will be spent is the economic factor, namely, that it must be so spent as to earn a reasonable rate of return. This economic condition applies to the improvement of methods for handling freight in the port of New York just as it applies to every other branch of industry. Now let us analyze some of the conditions which slow up the universal use of mechanical devices for handling material in the port.

The port is suffering from two conditions, one of which is beyond our control—its geography, and the other, which might have been controlled but was not, namely, its facilities, which to a large extent just grew instead of being planned.

Its geography, a wonderful asset with its fine harbor and great length

A paper presented at a meeting of the Metropolitan section of the American Society of Mechanical Engineers, New York, March 1, 1927. The author is application engineer, material handling, industrial engineering department, General Electric Co. and is an associate member of the American Society of Mechanical Engineers.

of shoreline, makes it on the other hand largely a lighterage port, which necessitates extra handling of goods and adds the cost of operating the lighters—which someone must pay for, even though free lighterage is offered in many cases. Even with this handicap a tremendous improvement could be made if all facilities such as railroad tracks, steamship and railroad terminals, warehouses, car ferries, etc., could be relocated to the best advantage and all designed to fully utilize modern mechanical methods of handling material. To effect such a program will require years of time, millions of capital expenditure, and the overcoming of many other obstacles. This in general is the work being initiated by the Port of New York Authority, and its representative, Mr. Wilson, will no doubt agree that they have a long and complicated problem before them.

Mechanical Devices Must Pay

With this as a background we can turn to a closer study of the present use of mechanical devices for handling material. It is quite obvious that such a study must consider all conditions as they are and as they probably will be some years in the future, and not as we would like them to be. The use of mechanical devices is again subject to the economic law that they must pay a reasonable return on the invested capital to justify their use. It might be argued that in some cases machinery is justified even though it does not yield an adequate return on account of certain indirect benefits which may accrue from its use. It is often rather difficult, however, to make this argument convincing with privately owned operating companies, and where it is effective with publicly owned operated companies someone must stand for the direct operating loss, and that usually means that the public pays it in higher taxes.

One feature mitigating against the use of machinery is the design of existing structures. It is all very well to say, for example, that a pier should be equipped with a battery of cargo cranes such as is seen at Hamburg—and figures might be produced to show more economical handling by their use; but if the pier has foundations which will not stand the added weight and an area on which they cannot be successfully mounted, a complete new pier is necessary before the cranes may be used. The old pier may have many years of useful life under existing conditions of operation, and it would be exceedingly difficult in many cases to prove the economic justification of a new pier, the increased size, in order to get even if physical conditions permitted the advantage of crane operation. This is only an example, but many similar ones could be cited for other buildings and other types of machinery.

There is also the question of whether present established methods of stevedoring will permit the efficient use of machinery. These methods cannot be changed overnight, and a great deal of educational work faces those who attempt to introduce machinery which requires radical changes in methods. Fortunately, reports from industry as a whole and the views of labor leaders as expressed in public statements indicate that labor is becoming more receptive to improved mechanical methods, and as this feeling increases it will gradually spread to all branches of industry, including material handling, and make this problem easier to solve.

Use Mechanical Devices To Cut Handling Cost

In this paper the author has made a sane and impartial analysis of the problem of more efficient handling of freight at the port of New York. The engineer dealing with this question must go beyond the mechanical efficiency of the handling device suggested for adoption, to the correct solution of all the questions involved in determining the possible overall economy which will result. It is important, however, for those who are engaged in this business to be of open mind and to make themselves thoroughly familiar with new developments in mechanical handling methods with the view of adoption if cost can be reduced.

The introduction of mechanical devices has been further hampered by installations which have not proved their worth from an economic standpoint. The reasons why such installations have not been successful may have been due to any one or a combination of various causes, some of which are lack of accurate operating and cost data on which to base a reliable analysis of the problem, failure to appreciate the relation of existing stevedoring methods to operating methods required with the machinery to be used, geographical location of the installation in the port, failure of the tonnage handled to meet the anticipated amount, selection of a type of machinery not best suited to the peculiar requirements and operating conditions, etc.

No spirit of criticism is intended in any of the foregoing, it being merely an attempt to point out some of the difficulties confronting the port, and to show by what follows that in spite of these handicaps the port has progressed and is progressing in the use of mechanical handling devices.

Methods In Handling Bulk Freight

Starting with bulk freight, which best lends itself to the use of machinery, we find the port using methods which are probably only surpassed by the Great Lakes ports—the most efficient in the world in this respect due, of course, to peculiar operating conditions, which cannot be duplicated in the port of New York. Coal for ocean shipment is unloaded by nine car dumpers which can average a car of coal about every two minutes for each dumper. This means that each dumper if handling 70-ton-capacity cars could load a 5000-ton boat in about 5 hours, making reasonable allowance for shifting the boat and for other delays. Coal for the large power stations is handled by high-speed grab-bucket hoists handling from 250 to 300 tons per hour to heights of as much as 200 feet with a power consumption of about 1 kilowatt-hour per ton. At this rate one hoist can unload a 5000-ton boat (the equivalent of 75 carloads) in about 24 hours. Smaller grab buckets and flight conveyors are handling the coal for local dealers, and, while not as efficient as the larger hoists, are certainly reducing labor costs to a minimum. There is no doubt an opportunity for increased efficiency by the consolidation of these small dealers, thus enabling them to combine their handling facilities and work them more effectively. Grain-handling facilities are quite adequately provided by five storage elevators with a capacity of seven million bushels and equipped for direct loading to vessels, twelve floating elevators for loading ocean vessels from barges, and one pneumatic floating elevator for transferring from ocean vessels to smaller boats. The charge for handling grain is one cent a bushel plus $1.50 per thousand, with an addition of $4 per thousand for trimming. One of the large storage elevators has a record of loading 221,000 bushels into a steamer in 16 hours, and could easily handle three or four such boats a week. Two railroads

(*Continued on Page* 54)

Reviews of Late Books

The Bridge to France, by Edward N. Hurley; cloth, 328 pages, 5¼ by 8 inches; published by J. B. Lippincott Co. Philadelphia and furnished by MARINE REVIEW, Cleveland, for $5.00 postpaid, and in Europe by the Penton Publishing Co. Ltd., Caxton House, London, for 25 shillings.

Edward N. Hurley the author of this book was the war time chairman of the United States shipping board and member of the World war debt commission. He has set down in this book in an interesting manner, important historical facts concerning the greatest shipbuilding venture the world has known. It tells the inside story of the operation of the shipping board and Emergency Fleet Corp. and those vital facts in the activities of the naval, military, political and economic policy which were bound up with the great work performed under the author's direction.

The history of the shipping board and Emergency Fleet Corp. up to the time Mr. Hurley took charge is briefly reviewed. The story is then told of the planning and building of the fabricated steel ships, wooden, composite and concrete ships. An account is given of the building of that tremendous fabricating shipyard at Hog Island and the production of ships there.

Many of the phases of the board's work are fully covered, such as the operation of the fleet which carried troops and supplies abroad, the recruiting housing and transportation of shipyard workers, making seamen out of landlubbers, protecting ships from submarines, and convoying ships across the Atlantic.

The book is profusely illustrated with photographs, war posters, facsimilies of letters and documents of historical interest. In connection with the board's work the reader is brought in contact with the work and personalities of Wilson, Schwab, Edison, Ford, Colby, Hoover, Pershing, Lord Northcliffe, Geddes, House, Dawes, Lord Reading, Foch, Lloyd George, Clemenceau and others with whom the author had dealings. Many incidents of human interest are told.

There is an interesting account of Foch and the Germans at Treves, and of the Spa and Brussels conference. Some interesting examples are given of European diplomacy. Events are related concerning the administration of Woodrow Wilson and the launching of his ploitical career that has never before been published. All in all this book deals in a straight forward and interesting manner with the gigantic problems overcome by the shipping board during the pressure and emergency of war.

* * *

Hero Tales of Our Navy, by George Gibbs; cloth, 303 pages, 5 x 7 inches; published by J. B. Lippincott Co., Philadelphia, and furnished by MARINE REVIEW, Cleveland for $2.00 postpaid, and in Europe by the Penton Publishing Co., Ltd., Caxton House, London for 10 shillings net.

A merchant marine or a navy to have arrived at any standing or eminence must have proud traditions. The fighting qualities and skillful seamanship of the officers and men of the early American navy are an inspiration to those who follow the seas in American ships today.

In this book the author gives to the reader by means of fourteen illustrations drawn by himself, and a clear forceful style, a picture of the many sea fights in which early Americans distinguished themselves. Many bloody and obstinate combats are described in these stories of our naval heroes from the time the first little American built frigate sailed out against an English man-o'-war to the days when the allied battleships patrolled, in friendship and harmony, the North Sea.

Names famous in American history appear in these pages, John Paul Jones and Decatur, Stewart and Hull, Jarvis and Farragut. We read of the exploits of the BONHOMME RICHARD, the INTREPID and the CONSTITUTION. Here is painted all the glory of the old navy when the sailor hoisted his top gallant sails and made straight for the enemy, when cruises were long and perilous and the disobedient were only too often "spread-eagled" or forced to ride the gray mare.

It is pointed out however, that the mettle of a seaman is just as surely tried in the navy of today and there are heroes in the new navy also. The author pays tribute to the courage of the unnamed and unheralded men of the fishing fleet who experience, as all in the day's work, the dangers of the Atlantic in storms, darkness and fog.

* * *

The Ship Under Sail, by E. Keble Chatterton; cloth, 224 pages, 6 x 8 inches; published by J. B. Lippincott Co., Philadelphia and furnished by MARINE REVIEW, Cleveland for $4.50 postpaid and in Europe by the Penton Publishing Co., Ltd., Caxton House, London, for 22s 6d, net.

In his customary clear and interesting style the author has given to the reader in this book a splendid picture of the earliest beginnings of the ship under sail down to its last glorious epoch. This book will be of interest to all who love ships and seafaring. It is illustrated with 36 plates of many fine ship models, old prints and paintings of famous and historic ships.

This book is full of curious sealore which is the result of many years of research. It is from such facts that the reader obtains a clear and a vivid idea of the evolution and many changes in the development of the sailing ship. It is far more than an account of the gradual development of rig and hull. The author manages with great skill also to give the reader a picture of the conditions of sea life, its problems and progress during the last 800 years. Written in an entertaining style and still with utmost regard to accuracy, there is nothing dull in this history.

Some idea of the scope of the book may be had from the following enumeration of its seventeen chapters: The Earliest of All Rigs; The Early Mediterranean Ship Rigs; The North European Rig; Mediaeval Rigs; Caracks and Caravels; Tudor Ships; At Sea in the Sixteenth Century; Ships of the Seventeenth Century; Eighteenth Century Rigs; East Indiamen; Clipper Ship Days; The Glory that was Sail; Early Fore-and-After; Development of the Fore-and-After Rig; Cutters and Luggers! Progress of the Fore-and-Aft Rig; and the Fore-and-Afters Finally.

Assistant Sales Manager

Announcement has been made by the Sperry Gyroscope Co. of the appointment of R. B. Lea as assistant sales manager of the company. He will also continue as manager of the marine department. Mr. Lea became associated with the Sperry company immediately after leaving Cornell in 1915 and has had experience in nearly all departments of the company. He has a large acquaintance among marine people throughout the world.

The YOMACHICHI under conversion from steam to diesel power at the Newport News Shipbuilding and Dry Dock Co. will be equipped with four Maxim silencers to go with the engines.

Equipment Used Afloat, Ashore

New Design Oil Cup for Reciprocating Steam Engines—Does Not Clog—Boiler Gage Light—Electric Driven Mortiser for Joiner Work

THE mechanical means by which marine engines are lubricated are a part of the design of the unit. It is fair to assume that the lubrication system so installed has been developed and perfected through many years of practical operation. However certain features which give trouble have never been satisfactorily corrected. Since lubrication is vital not only to the efficiency of the machinery but to its very life, this is a matter of genuine concern to the operating engineer and to the owner of the vessel.

On the Great Lakes practically all vessels are propelled by reciprocating steam engines similar in design, and they are operated under similar conditions. A heavy bodied highly compounded oil especially suitable for maintaining a film of oil under wet conditions should be used for lubricating cross-head pins, crank pins, slides and guides and main bearings.

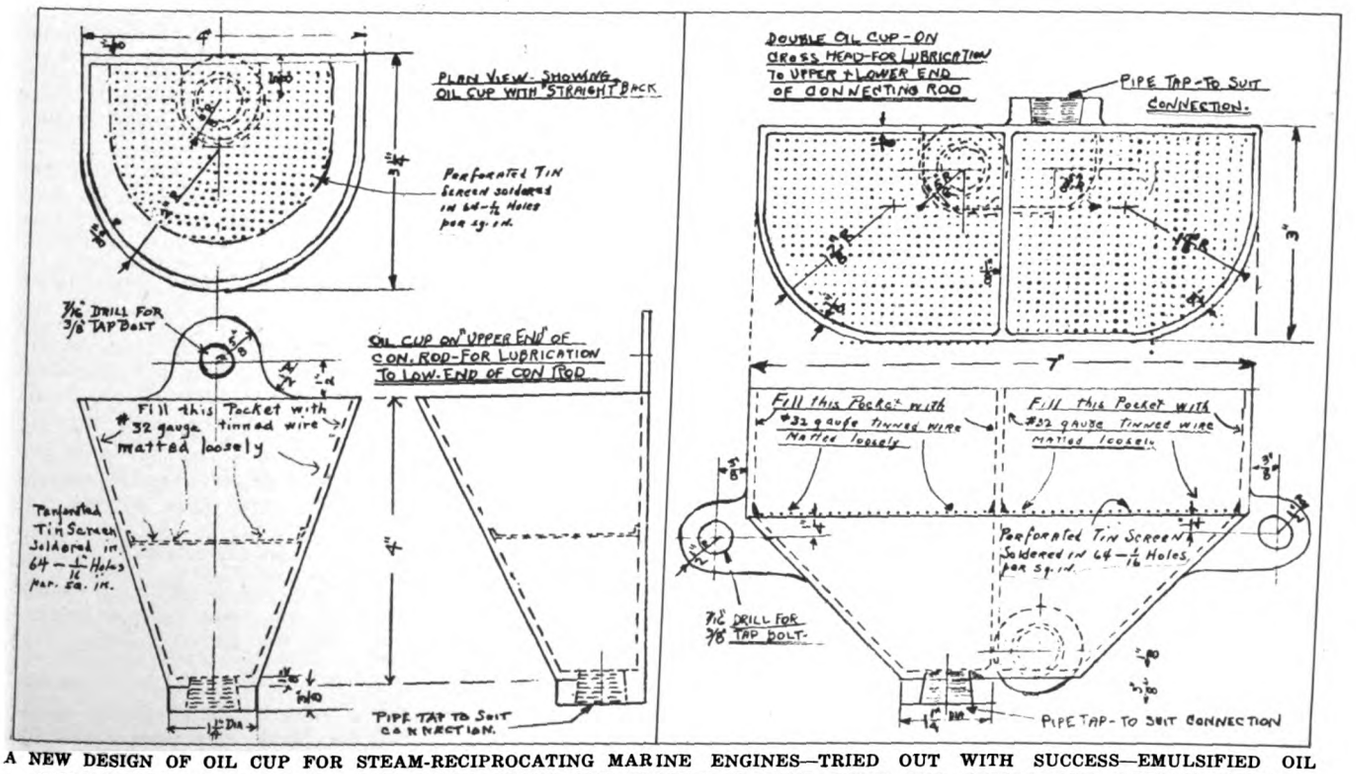
The customary manner for getting oil to the cross-head pin and the crank pin is to feed this oil through a funnel shaped cup (known as a wiper cup) attached to the cross head and receiving make up oil from the reservoir by drip contact in the upper position of the cross-head. This cup at the bottom has connected to it a small diameter copper tubing. The oil in the wiper cup is held in place by horse hair and made to feed slowly through the pipe to the cross-head pins and crank pins. A serious difficulty is met with in practice due to emulsified oil clogging the connection between the wiper cup and the pipe or the pipe itself. This condition will, of course, stop the feed of lubrication and is dangerous.

To overcome this difficulty a wiper cup of the design shown in the accompanying illustration has been developed. The cup is of composition casting and is of the same shape and size as the cup commonly used at the present time on vessels of the Great Lakes. There are, however, some very important differences in arrangement. In the first place it is recommended that the pipe connecting with the cup should be at least of ⅜-inch diameter. Approximately half way down in the cup a screen of tinned copper is soldered in place dividing the cup horizontally. Above this screen a ball of No. 32 tinned wire is inserted to take the place of the horse hair ordinarily used. Across the top of the cup, holding the ball of twisted tinned wire in place, are three or four 12 gage, or thereabout, brass wire rods.

As the oil is fed to the wiper cup it percolates through the mass of twisted tinned wire, which will not become soggy as the horse hair is inclined to do and the oil will feed readily through the screen and into the oil pipe thus eliminating all chance of emulsification in the wiper cup causing a tit of more or less solidified oil to form at the bottom of the cup or in the pipe leading from the cup and thus stopping the proper flow of lubrication.

The accompanying illustration shows how this new type of wiper cup is made in single or double style. From practical tests on several ships on the Great Lakes it is believed that this new style of cup will do away with oil stoppage trouble now frequently experienced. The Ontario car ferries and the boats of the Port Huron and Sarnia Ferry Co. and several freighters have found the use

(*Continued on Page* 52)



A NEW DESIGN OF OIL CUP FOR STEAM-RECIPROCATING MARINE ENGINES—TRIED OUT WITH SUCCESS—EMULSIFIED OIL CANNOT SOLIDIFY AND BLOCK PASSAGE TO CRANK AND CROSSHEAD PINS—BOTH THE SINGLE AND DOUBLE TYPES ARE SHOWN

Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review

By Harry Bowne Skillman

Attorney at Law

THOUGH it manifestly is the duty of a master (or owner) to furnish proper medical attention and necessities to the seamen over whom he has charge, whether they request it or not, where a seaman himself does not consider himself sick, and makes no complaint whatever, this obligation cannot be held so extensive as to require inquiry as to latent ailments.—Willey v. Alaska Packers' association, 9 F. (2d) 937.

* * *

THE law imposes upon owners of ships the duty of using due care to ascertain and consider the nature and characteristics of goods offered for shipment, and to exercise due care in their handling, including the adoption of such methods as their nature require.—WILLFARO, 9 F. (2d) 940.

* * *

CHARTER party providing for whole vessel, or sufficient room for cargo of 530 to 600 metric tons, does not obligate the charterer to pay freight on 600 tons, where only 537 tons were shipped.—GENEVA, 9 F. (2d) 942.

* * *

SALVAGE awards, it was declared in FLORENCE LUCKENBACH, 9 F. (2d) 1008, are not made by fixed rule, and of necessity they vary with the circumstances of each case. The promptitude of salvors' services, their skill and energy, and the risk to which they exposed themselves, the value of the property employed by the salvors in rendering the services, and the danger to which this property was exposed, together with the degree of success achieved by them, the value of the property saved, and the danger from which this property was rescued, must be considered in making an award.

* * *

MERE excess of damage over what is usual under the circumstances is not prima facie evidence of negligence in stowage.—BENCLEUCH, 10 F. (2d) 49.

* * *

ADMISSION in bills of lading that lemons were received "in apparent good order and condition," goes no further than to create prima facie proof that to the eye the boxes were secure and sufficient, and that the lemons, so far as visible, were not damaged. It does not prove that the fruit was inherently sound.—BENCLEUCH, 10 F. (2d) 49.

* * *

WHERE charterer agreed to return scow in as good order and condition as when received, less ordinary wear and tear, it will be responsible for damage caused by sinking at wharf, unless it was due to negligence of captain.—Schoonmaker-Conners Co. Inc., v. Rosoff Engineering Co. Inc., 10 F. (2d) 64.

* * *

PHRASE "customs and usages at the ports of loading and discharging to be observed, unless otherwise expressed," in charter clause allowing charterers a certain number of days for loading, referred to customs and usages as to allowance of Sundays, holidays, bad weather days, etc. and not to other clauses of the contract.—Wilkrus v. Trafikaktiebolaget Grangesberg Okelosund, 10 F. (2d) 129.

* * *

SEAMAN, who, before commencement of voyage, refused to consent to provision inserted in articles after he had signed, was not subject to discharge at first port of call because of such refusal, it was decided in STEEL TRADER, 110 F. (2d) 248; where so discharged, the seaman was entitled to wages to the end of the voyage.

* * *

CONTENTIONS that range lights on river bank are designed to peremptorily fix the course of vessels and direct their movements, acting as semaphores do on a railroad, and that vessels must steer in exact accord with them, cannot be sustained, declared the court in the case of LE COQ, 10 F. (2d) 246. "These range lights," said the court, correspond with the channel range markers, similarly located, used by day as an aid to navigation, and merely indicate the deepest channel courses in the river. The navigation of a ship in any part of the navigable water in the river, without reference to the range lights or markers, is not unlawful, nor evidence of negligence per se. On the other hand, the anchoring of craft of any kind in or near such fairway is not unlawful, nor evidence of negligence per se."

* * *

SEAMAN cannot recover costs of cure when, having received attention at a marine hospital, he has expended nothing in his cure. But expenses actually incurred for treatment beyond that which was given him without cost at such a hospital are recoverable, unless the seaman has rejected the hospital service when available. The rule of law which gives a seaman the right to recover his costs of cure and maintenance extends to the master.—BALSA, 10 F. (2d) 408.

* * *

UNDER inland rules, a steamer passing a motorboat is bound to keep out of the way, and the motorboat may keep her course and speed, according to the case of ROBERT FULTON, 10 F. (2d) 424. The court also said that the fact that suction of an overtaking vessel is a frequent cause of collision, especially if she is larger than the overtaken vessel and the channel is narrow and shallow, is well known.

* * *

TUG, undertaking to tow two deck lighters, was not an insurer, and the mere loss of the tow raised no presumption of fault against the tug. While it was true that the lighter in question in the case of MORNING STAR, 10 F. (2d) 538, was not of a type used for towing at sea, except when being towed from one port to another, the tug was only bound to bring to the performance of its duty reasonable skill and care, and such consideration as the special circumstances of the case demanded.

* * *

PERIL of the sea means something so catastrophic as to triumph over those safeguards by which skillful and vigilant seamen usually bring ship and cargo to port in safety.—CITY OF DUNKIRK, 10 F. (2d) 609.

* * *

LAST vessel coming to anchor in anchorage grounds is bound to allow ample berth space to a vessel already at anchor.—William Lyall Shipbuilding Co. v. United States, 10 F. (2d) 620.

* * *

VESSEL without cargo in her hold, and with hatch covers on and bolted, is as seaworthy in the general sense without a covering tarpaulin as she is with one. That protection, it was said in EDITH, 10 F. (2d) 684, is put on solely for cargo purposes, or at least to keep dry whatever may be in the hold. The act of placing and fastening a tarpaulin is a part of the care of cargo. The furnishing of proper dunnage is a part of stowage, it was decided, and failure to provide dunnage where reasonably necessary is a fault in stowage.

* * *

WHERE owner failed to deliver ship according to charter, measure of damages is difference between contract price and market price of substitute tonnage.—Pendleton Bros., Inc., v. Pearce, 10 F. (2d) 692.

* * *

ON LEASING a pier or wharf, the lessor may reserve the right to charge wharfage against vessels not owned or chartered by the lessee.—M. L. C. No. 10, 10 F. (2d) 699.

Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	487	2,048,786	565	2,353,404
March	460	1,936,478	515	2,074,694
February	408	1,679,912	468	1,962,365
January	417	1,736,991	455	1,868,270
December	466	1,867,630	548	2,171,938
November	454	1,909,756	477	1,885,401
October	486	1,954,853	542	2,301,465
September	492	2,087,694	543	2,270,398
August	491	2,034,147	507	2,075,643
July, 1926	498	1,943,133	546	2,251,396

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	86	194,135	52	123,179
March	96	223,255	58	131,147
February	81	190,536	48	126,619
January	79	208,354	59	167,258
December	145	373,902	129	341,421
November	168	429,403	139	377,016
October	145	370,112	128	329,420
September	107	284,144	82	196,434
August	109	248,435	81	170,661
July, 1926	92	191,680	69	128,381

Boston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	120	343,388	72	201,868
March	95	301,413	59	187,556
February	83	277,068	40	119,246
January	88	266,147	51	159,241
December	97	286,013	52	170,314
November	89	275,245	56	177,876
October	109	300,921	58	171,983
September	105	308,189	83	246,136
August	128	321,377	96	206,879
July, 1926	152	336,135	108	274,513

Portland, Me.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	21	37,182	21	37,114
March	23	63,195	27	73,944
February	23	65,826	21	59,178
January	25	59,155	26	66,791
December	32	71,748	34	77,400
November	20	34,092	20	34,917
October	20	48,468	23	52,900
September	24	43,783	19	35,828
August, 1926	23	47,089	26	45,669

Providence

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	7	28,776	5	18,903
March	7	26,065	7	25,780
February	3	10,380	6	23,696
January	3	9,632	6	20,091
December	5	17,666	5	19,074
November	2	7,689	2	7,690
October	7	23,091	8	29,815
September	5	20,651	5	22,324
August	6	20,764	3	12,299
July, 1926	7	29,207	5	18,641

Portland, Oreg.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	31	120,431	44	159,247
March	21	78,379	31	106,768
February	15	63,320	28	106,355
January	29	102,736	39	134,127
December	34	131,426	56	213,861
November	34	135,455	48	173,820
October	41	151,018	59	217,745
September	33	126,772	56	201,152
August	40	150,609	46	167,419
July, 1926	24	93,977	33	127,270

Baltimore

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	131	409,145	127	377,039
March	120	355,162	117	323,893
February	100	308,501	95	301,401
January	117	362,553	126	361,277
December	245	722,141	269	783,058
November	292	818,707	298	853,723
October	271	791,999	261	783,268
September	230	678,127	224	670,465
August	228	672,453	221	639,677
July, 1926	211	644,261	202	603,648

Norfolk and Newport News

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	23	54,983	77	209,869
March	32	87,970	98	264,863
February	31	88,928	77	232,403
January	49	134,238	118	350,311
December	216	636,483	254	781,545
November	184	527,290	281	782,914
October	252	683,297	307	850,828
September	252	705,604	281	766,503
August	188	545,861	255	733,837
July, 1926	267	727,374	309	854,305

Savannah

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
January, 1927	39	.....	34	96,410
December	38	107,763	36	104,445
November	40	97,689	33	102,822
October	50	115,821	39	98,521
September	46	120,271	42	113,706
August	42	97,563	30	76,030
July	33	88,673	27	71,040
June	43	106,733	36	95,000
May	36	96,175	32	85,198
April, 1926	37	104,323	36	105,821

Key West

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	78	79,818	74	75,913
March	80	91,602	75	93,700
February	90	101,179	84	102,571
January	89	116,112	89	119,191
December	92	113,985	87	104,448
November	97	116,965	97	115,032
October	78	92,987	79	96,718
September	81	91,321	80	88,844
August	84	98,702	87	99,362
July, 1926	78	86,124	77	86,323

Mobile

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	107	240,273	108	218,246
March	107	217,848	98	197,395
February	99	249,158	86	199,907
January	96	224,819	83	191,752
December	82	164,129	82	174,618
November	90	200,301	83	182,839
October	98	213,430	99	211,785
September	84	179,225	75	165,838
August	89	166,164	81	158,197
July, 1926	86	153,642	84	159,256

Seattle

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	46	186,581	49	185,593
March	39	159,034	44	175,937
February	40	170,776	45	195,692
January	53	233,914	47	192,233
December	42	176,065	54	201,988
November	63	234,742	54	231,843
October	56	236,587	55	230,412
September	54	219,623	58	233,320
August	53	229,111	48	206,042
July, 1926	35	146,670	31	126,407

New Orleans

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	262	642,846	268	664,467
March	276	712,619	278	695,933
February	240	632,092	249	628,762
January	240	697,039	244	712,284
December	259	745,636	266	755,204
November	253	731,871	238	685,253
October	236	673,606	250	721,608
September	226	620,095	240	666,778
August	275	764,464	256	721,654
July, 1926	263	716,066	270	739,005

Charleston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net. tonnage	—Clearances— No. ships	Net tonnage
April, 1927	23	60,557	26	68,555
March	28	84,155	31	85,476
February	27	81,829	33	158,088
January	33	96,054	31	77,315
December	33	94,427	39	102,724
November	39	114,449	39	103,266
October	11	32,323	15	40,127
September	22	65,872	34	98,447
August	24	64,334	20	51,505
July, 1926	13	37,020	13	33,908

Galveston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
February, 1927	43	114,628	82	248,364
January	47	146,318	97	318,609
December	56	147,040	103	302,474
November	64	180,917	118	359,948
October	47	112,816	118	352,203
September	52	139,219	127	368,302
August	55	129,477	131	389,432
July	60	164,241	116	352,290
June	53	119,497	72	185,444
May, 1926	28	65,578	61	180,449

Los Angeles

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	179	477,762	173	441,374
March	156	451,428	165	442,022
February	144	418,190	144	404,753
January	137	420,426	138	381,692
December	155	438,464	123	386,004
November	184	439,736	138	387,937
October	187	448,038	155	421,807
September	151	406,314	211	386,739
August	143	458,240	151	399,349
July	127	460,296	103	352,367
June, 1926	123	349,936	88	344,187

San Francisco

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
April, 1927	141	531,380	137	518,577
March	145	555,324	148	586,354
February	147	561,214	138	513,253
January	133	497,560	141	522,806
December	134	520,962	134	500,347
November	128	543,103	139	512,671
October	145	532,024	153	575,263
September	170	568,323	156	561,513
August	169	580,310	111	466,346
July, 1926	160	523,527	102	495,849

Port Arthur

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
February, 1927	34	80,063	31	84,324
January	22	57,644	28	84,531
December	25	72,885	31	100,184
November	25	67,293	31	96,171
October	19	53,558	23	71,270
September	15	43,874	22	72,960
August	19	63,639	24	71,545
July	25	79,464	32	98,637
June	22	70,743	30	97,056
May	20	60,276	36	95,754
April, 1926	32	95,592	38	108,923

Increase in Lake Draft

The shore captains committee of the Lake Carriers' association has recommended an increase of draft to 19 feet on routes to and from ports on Lake Michigan and Lake Superior. This is 9 inches more than the draft a year ago and 3½ inches more than the draft recommended at the opening of this season. The gain in draft will mean larger cargoes, and increased revenue.

The Luckenbach Steamship Co., New York, was the successful bidder for the lease of municipal pier 84, south wharves, foot of Porter street, when the five-year lease was auctioned.

The bid for the period was $575,000. This is about what similar leases have been selling for. The company was represented by R. C. Thackara, vice president. It now operates pier 78. Pier No. 84 is one of the city's newest piers.

Great Lakes Red Book 1927 Edition Ready

More than 1200 vessels operating on the Great Lakes and the St. Lawrence river west of Montreal, are listed in the new 1927 edition of the Great Lakes Red Book. The name of both the owning and operating companies, their addresses, the names of the captain and chief engineer of each vessel, the capacity of the bulk freighters, and a directory of shipyards and ship repair plants are given in this convenient vest-pocket size directory.

Publication for 25 years has proved the value of this directory and the importance of its information to those carrying on business with lake companies and vessels. Its information is thoroughly accurate and up-to-date, since the vessel companies are the sources for the data.

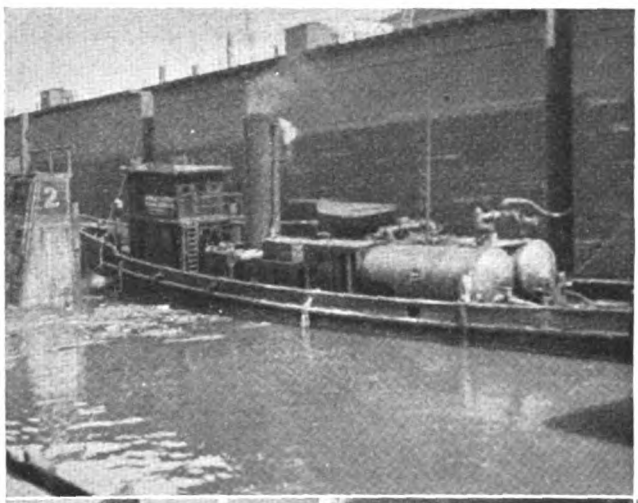
The Red Book is published by Marine Review, Penton building, Cleveland, and retails for $1.

Overseas Shipments Grow

Cargoes moved through American ports during 1926 were 20 per cent greater than for 1925 when the previous high record was reached, according to a special report by the United States shipping board bureau of research. The total volume of waterborne foreign commerce through our ports last year exceeded 112,900,000 cargo tons.

The 1926 export total was 68,100,000 tons, or 34.7 per cent greater than the export total of 1925. Most of this increase consisted of coal shipments to meet demands caused by the strike in British coal mines. The coal exports of 1926 were 15,615,000 tons, 171.7 per cent above those of the previous year and reached a total of 24,700,000 tons, the greatest water borne movement of a single commodity ever recorded. Exports of commodities other than coal show an increase of 1,900,000 tons, 4.67 per cent over similar exports in 1925.

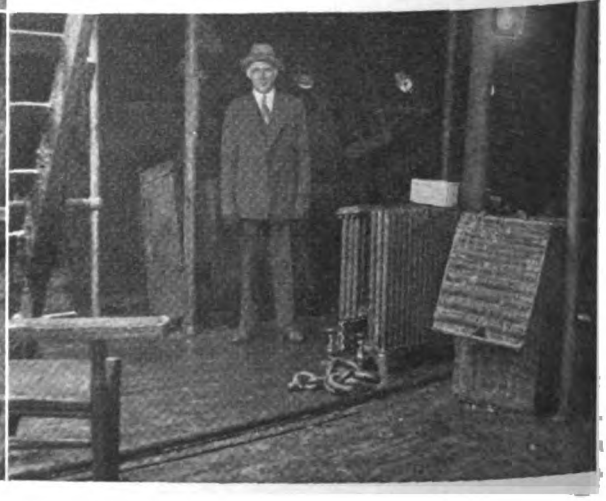
Mud and Silt Removed by Mechanical Process



THE steamer WASHINGTON IRVING *was rammed last summer by a carfloat and sank in the Hudson river near the Jersey side. She was raised nine months later and the first process after drydocking was the clearing away of hundreds of tons of mud and silt that had penetrated every part of the hull. The mud and slime in tween deck spaces for instance lay six inches to four feet deep, and was packed in solid drifts.*

The Salvage Process Corp., with much experience in difficult cleaning jobs and possessing the most modern equipment was chosen to do the work. The job was well done in good time.

To the left is shown the service tug SALVAGER *with pipe line and high pressure tanks, used for the work. To the left and below is a view of the cafeteria of the* WASHINGTON IRVING *before cleaning. Directly below, the cafeteria after cleaning, and in the background, H. L. Parker, marine manager of the Salvage Process Corp., who supervised the job.*



Late Flashes On Marine Disasters

Brief Summaries of Recent Maritime Casualties— A Record of Collisions, Wrecks, Fires and Losses

Name	Date	Nature	Place	Damage Resulting
Athabasca	April 25	Aground	Cedar Point	Not stated
Admiral Peary	April 25	Collision	Cape Flattery	Not stated
Avlon	May 1	Aground	Washington	Not stated
Ariano	April 27	Collision	St. John	Deck plating
Avalon	April 22	Struck bar	Grays Harbor	Total loss
Albany	May 5	Collision	North River	Damaged
Anthony O'Boyle	May 4	Ashore	Naushon Island	Floated
Annie Murphy	May 6	Collision	Searsport	Plates
Athenic	May 7	Collision	Buenos Aires Rds.	Not stated
Artemis	April 14	Fire	Rotterdam	Not stated
Astoria	April 13	Struck sub. rock	San Pedro	Plates
Atlantis	April 13	Collision	Cardiff Roads	Not stated
Asie	April 21	Fire	Bordeaux	Cabins
Aranagua	April 28	Fire	Trieste	Not stated
Arriluze	April 28	Aground	Nantes	Floated
Boswell	April 4	Disabled	Las Palmas	Engine
Bogota	April 21	Ashore	Port Morant	Floated
Barge No. 276	April 21	Collision	New York	Amidships
Bard	April 7	Ashore	Nr. Ushant	Not stated
Balto	April 12	Ashore	Melilla	Not stated
Bogota	April 28	Collision	Off Listons Point	Stem; bows
Barge No. 68	April 28	Collision	Off Listons Point	Not stated
Blair	April 29	Fire	New York	No. 5 hold
Balfe	May 5	Collision	Buenos Aires Roads	Forepeak
Barge No. 1	May 7	Fire	Brooklyn	Not stated
Benares	April 20	Fire	Antwerp	Not stated
Burnhope	April 26	Touched ground	Rouen	Not stated
Christel Vinnen	April 15	Ashore	Old Providence Island	Total loss
Camano	April 21	Ashore	Arecibo	Wrecked
Canadian Winner	April 22	Struck quay wall	Panama Canal	Starboard side
Collingdale	April 12	Ashore	Melilla	Wrecked
Conte Verde	April 12	Aground	Santos	Not stated
Colorado	April 30	Aground	New York	Floated
Cornell	May 10	Fire	Cleveland	Damaged
City of Omaha	April 29	Collision	Gothenburg	Not stated
Camden	May 2	Ashore	Bird Island Flats	Floated
Chaleur	May 5	Collision	St. John	Plates
Comus	May 9	Fire	Not stated	No. 2 hold
Cretecoal	April 12	Aground	Oran	Holed
Castilla	April 16	Aground	Melilla	Sank
Christel Vinnen	April 15	Ashore	Old Providence Island	Abandoned
Colombo	April 27	Struck rock	Naples	Not stated
Cork	April 27	Sank	Battersea	Floated
Delaware	April 20	Aground	Squaw Island	Floated
Drumahoe	April 23	Aground	Parisienne Island	Not stated
Dorothy	April 7	Ashore	River Deben	Floated
Den Haag	April 26	Collision	New Orleans	Damaged
Dauntless	April 29	Collision	San Francisco	Not stated
Devonbrae	April 13	Collision	Cardiff Roads	Port bow
Dumfries	April 12	Aground	Oran	Floated
Durango	April 17	Collision	Bordeaux	Port side
Delfina	May 12	Aground	San Pedro de Macoris	Not stated
Essex Friar	April 2	Aground	Cawthorne Chan.	Floated
Elisabeth	April 7	Ashore	Nr. Gluckstadt	Not stated
Elisavet	April 7	Hvy. weather	Port Said	Steering gear; deck
Edward Luckenbach	April 21	Collision	New York	Not stated
Ena F. Parsons	May 2	Collision	Apple River	Not stated
Emilie Maersk	May 5	Collision	St. John	Plates
Esles	April 13	Collision	Bay of Gibraltar	Not stated
Emmy L. D.	April 18	Stranded	San Stefano	Floated
Edison Brothers	April 25	Foundered	Merida	
Eastoft	April 29	Struck pier	Ramsgate	Amidships
Filbert	April 23	Aground	Major shoal	Floated
Freeport Sulphur No. 6	April 23	Collision	New Orleans	Damaged
Finland	April 29	Collision	San Francisco	Rudder
Filippo Artelli	April 13	Explosion	Barry	Not stated
Fred W. Thurlow	April 10	Gale	Off Cape Cod	Sank
Fordefjord	April 17	Fire	Shanghai	Damaged
Felipa	April 26	Ashore	Willemstad	Floated
Gypsum Queen	April 19	Disabled	Nr. Malinhead	Steering gear
Graig	April 6	Touched bottom and quay wall	Carthagena	Leaking
Gatinais	April 6	Aground	Havre Roads	Floated
Gledhill	April 12	Collision	Spurn Point	Not stated
Grimsby	April 12	Collision	Spurn Point	Port side
Goodwill of Bristol	April 11	Aground	Nr. Honfleur	Floated
Grangemouth	April 11	Collision	Rotterdam	Damaged
Golden City	April 25	Collision	San Francisco Bay	Sank
G. W. Parker	May 8	Fire	So. of Algonac	Sank
Hamlet	April 8	Ashore	Saldanha Bay	Not stated
Heredia	April 25	Collision	Havana	Not stated
Hartney W	May 3	Collision	Apple River	Fore rigging
Henrietta	May 10	Ashore	No. of Nauset	Floated
Henri Desmarais	April 27	Aground	So. of Escullos Bay	Bottom; forepeak
Ingeren	April 8	Collided dock	Barry	Windlass
Ida	April 8	Collision	Hamburg	Sank

Name	Date	Nature	Place	Damage Resulting
John D. Grase	April 16	Sprang leak	Plaquemine	Beached
Jersbek	April 21	Disabled	Off Marcus Hook	Engine
Joseph Frantz	May 5	Aground	Soo river	Floated
Jacob Luckenbach	May 8	Ashore	Costa Rica	Not stated
Joseph G. Butler	April 25	Disabled	Lake Superior	Lost rudder
Kinoene Maru	April 7	Sank	Tongochato	
Kamesit	April 26	Collision	New Orleans	Damaged
Kiowa	May 11	Ashore	Bellevue Island	Floated
Khiva	April 20	Ashore	Shanghai	Floated
Lancer	April 6	Collision	River Mersey	Plates
Luddesdown	April 11	Sank	Royal Victoria Dock	
Lake Giltedge	April 27	Ashore	South Pass	Floated
Langley	April 29	Explosion	Gravesend Bay	Not stated
Lurcher Lightship	April 27	Collision	St. John	Above waterline
Laurel	April 27	Aground	Jacksonville	Floated
Lingbank	April 26	Struck rocks	Northcarr	Sank
Lyd	April 28	Stranded	Lerwick	Not stated
M. A. Reed	April 20	Aground	Not stated	Floated
Monica Seed	April 6	Collision	River Mersey	Not stated
Mahratta	April 8	Struck pierhead	Manchester Canal	Port bow
Midsland	April 11	Collision	Rotterdam	Damaged
Melpomene	April 23	Collision	New Orleans	Damaged
Montpelier	April 25	Collision	Cape Flattery	Bulwarks
Madrono	May 6	Collision	Off Goat Island	Not stated
Manuel Arnus	April 19	Aground	Seville	Not stated
Mana	May 10	Collision	Kahului	Floated-turbine vane Rudder; tailshaft
Naui	April 21	Collision	San Francisco Bay	Not stated
Newport	April 25	Collision	San Francisco Bay	Not stated
Nicolaos Pateras	April 12	Aground	Melilla	Rudder; stem floated
Nellie	April 18	Sank	Off Advocate Harbour	
Otto Sinding	April 2	Collision	Antwerp	Port side
Ophelie	April 7	Aground	Orwell	Floated
Oley	May 6	Collision	Searsport	Not stated
Oued Tiflet	April 21	Ashore	No. of Casablanca	Not stated
Orizaba	April 27	Fire	New York	Not stated
Pacific Spruce	April 10	Fire	San Francisco	No. 2 hold
Pathfinder	April 23	Aground	Lansing shoal	Floated
Prometheus	April 26	Ashore	Malmo	Floated
Parks Foster	May 6	Aground	Stony Point	Floated
Philip Publicker	May 6	Collision	Philadelphia	Plates
Port Saunders	May 6	Collision	Off Goat Island	Sank
Primero	April 13	Collision	Buenos Aires	Not stated
Prins Der Nederlanden	April 21	Fire	Amsterdam	Not stated
R. L. Agassiz	April 28	Struck obs.	Duluth	Wheel
Roseric	May 2	Collision	Galveston	Plates
Robert Dollar	May 2	Aground	Southampton shoal	Floated
Riverina	April 19	Ashore	W. of Gabo Island	Bottom plating
Roche Grise	April 17	Collision	Bordeaux	Stem
Siretul	April 8	Collision	Hamburg	Not stated
Seattle Spirit	April 21	Aground	Philadelphia	Floated
Sultana	April 27	Struck dock	Milwaukee	Stem
Svanhild	April 25	Fire	Baltimore	No. 1 hold
Sagadahoc	April 24	Fire	Not stated	No. 3 hold
Sunugentco	April 21	Disabled	Portland, Ore.	Rudder
Stanley Hall	April 26	Aground	Tanga	Floated
Socony 12	April 28	Ashore	Portland	Floated
Steel Trader	May 2	Collision	Galveston	Not stated
Santa Rosalia	May 2	Aground	Cape Henry	Floated
Scotland Maru	April 13	Struck rocks	Tathong Point	Leaking
Skegness	April 17	Aground	Everett	Floated
Syra	April 13	Ashore	Piraeus	Not stated
Stanley Hall	April 26	Aground	Tanga	Not stated
Svanhild	April 25	Fire	Baltimore	Not stated
Santa Aurora	April 27	Collision	Granton	Plates
Three Marys	April 23	Fire	Mobile	Not stated
Taunton	April 18	Stranded	Hartland Point	Floated—No. 2 hold
Thomas K.	April 16	Sank	New York	
Taygeta	April 29	Disabled	Esbjerg	Propeller shaft
Unkai Maru No. 3	April 5	Waterlogged	China Eastern Sea	Abandoned
Unkai Maru	April 8	Stranded	Nr. Hinomisaki	Not stated
Ulf	April 26	Struck quay wall	Havre	Below waterline
Varanger	April 5	Disabled	Port Said	Machinery
Veta Louise	April 25	Collision	Havana	Sank
Westland	April 19	Aground	Spectacle reef	Floated
Winston Salem	April 18	Disabled	Off Hansweord	Cylinder
Winkfield	April 8	Struck dock	Calcutta	Rudder; sternpost
William Fairbairn	May 8	Struck pier	Soo	Plates
Wolhandel	April 26	Struck bank	Small Bitter Lakes	Rudderhead
W. D. Rees	May 11	Aground	Erie	Floated
Yukondoc	April 20	Hvy. weather	St. Mary's river	Damaged
Yorkdale	April 2	Collision	Antwerp	Not stated
Zamora	April 5	Aground	Bremen	Floated
Zalo	April 26	Touched ground	River Seine	Not stated

What the British Are Doing

Short Surveys of Important Activities in Maritime Centers of Island Empire

DURING April there was a marked increase in tonnage launched on the Clyde. In Scotland 26 vessels of 34,217 tons were launched during April, of which 22 of 33,799 tons were constructed on the Clyde. Contracts announced during April included a turboelectric liner of 19,000 tons gross to be built by Alexander Stephan & Son Ltd., Linthouse for the Peninsular & Oriental Steam Navigation Co., a cargo steamer of about 5070 tons for T. & J. Harrison of Liverpool to be built by Charles Connell & Co. Ltd. Scotstoun, a cargo steamer of 1000 tons for the Newcastle & Hunter River Steamship Co., Sydney, New South Wales to be built by the Ayrshire Dockyard Co. Ltd., while a number of vessels of less than 1000 tons were also ordered.

* * *

THE Furness Shipbuilding Co. Ltd. of Haverton Hill-on-Tees successfully launched the single screw oil tank steamer WINDSOLITE built to the order of the Imperial Oil Ltd., Toronto for the carriage of oil in bulk on the Great Lakes and St. Lawrence service. The WINDSOLITE is a tanker of a single deck type with poop and forecastle and expansion truck over the range of oil compartments built of the Isherwood combination system of framing to Lloyds highest class for carrying petroleum in bulk. The adoption of the builders multiple drilling system has been a feature of the construction, a system which is noteworthy for rapidity of construction and exceptional excellence of workmanship which is of special importance in oil tank vessels.

* * *

WHAT is considered to be the world's largest dock is to be opened by King George in July. This is the Gladstone dock at Liverpool which has cost over £7,000,000 to build. Connected with the existing system by a lock 645 feet long and 90 feet wide it has a water area of 55¼ acres and the sheds on the 2¾ miles of quayage have a gross floor space of 57 acres. To allow of unrestricted movement on the quays 62 huge electric cranes are mounted on the roofs of the sheds, those on the roadside being movable on tracks. The system includes a graving dock, the largest dry dock in Europe. When completed the largest vessels in the world will be able to enter and leave the docks on all tides of the year, while ordinary sized vessels can go in and out at any time of any day.

* * *

SIR THOMAS ROYDEN BART, speaking at the annual meeting of the Cunard Steamship Co. mentioined that the total mileage of their passenger steamers was greater by over 100,000 miles than that of the previous year notwithstanding which there was a decrease in operating expenses, the two largest components of which were seagoing staff and fuel oil. The Cunard bill for oil fuel was actually larger than that paid by the British Admiralty and its cost at present did not compare favorably with the cost of coal. It had its advantages, however, as the express steamers could make more voyages under oil fuel than would be possible on coal owing to the quicker loading of the former while cleanliness and reduced engine room crews were also items to be considered. It was due to oil fuel that the company's passenger steamers were able to sail at advertised dates during last year's strikes despite the disturbed condition of business. Sir Thomas expressed the view that with the better state of undustrial affairs that now existed they were justified in looking for some improvement in travel across the Atlantic and the freight business would be better than last year.

* * *

ACCORDING to a report from Sheffield, prospects in the armament trade are a little brighter than they were, but foreign competition is very keen even in warship construction in these days, and the attraction of a subsidy to Italian yards has drawn prospective purchasers to Italy. It appears that prices quoted by Italian yards for warships are much higher than had been expected and in the case of the Brazilian naval commission which visited several Italian yards with the object of inquiring how far Italy's favored position would benefit the buyer, they came to the conclusion that prices were too high.

What's Doing Around The Lakes

GREAT LAKES excursion boats will begin their runs the last Saturday in June, and the regular summer schedules will become effective at about that time. Traffic officials are putting the finishing touches to rate schedules, and comparatively few changes are being made from last year. In a few cases, however, additional boats are to be routed to take care of the business.

THE GOODRICH TRANSIT CO. is putting on the steamship ROOSEVELT for daily trips this summer between Chicago and South Haven, Mich., the first for that line between those points. The schedule calls for one night boat each way. These points also are being served by the Chicago & South Haven line. South Haven long has been popular as a summer resort, and is an important contact point for a large fruit area. Indications are that fruit shipments this summer will be of heavy volume.

* * *

THOSE who study lake levels, particularly at Chicago, assert they have information to show that within four years the level of Lake Michigan should reach 581 feet above the sea, which is approximately the average level since 1860. They argue that lake levels are getting back to normal. It is pointed out that since the winter

of 1925 Lake Michigan has been slowly recovering from the effects of the dry years from 1917 to 1925. Increased rainfall is attributed to the rise in Lake Michigan water during April by the Chicago sanitary district engineers. Statistics of the government lake survey show that Lakes Michigan and Huron rose three-tenths of a foot during that month. Lake Michigan now is about 0.96 of a foot higher than a year ago, and in the latter part of April was only 4.45 feet below the high stage of April, 1886. It was 1.06 feet below the average stage of April for the last ten years, it is declared. Figures cited for the other lakes are taken to show that Lake Superior has risen 1.31 feet in the past year; Lake Erie has gained 0.94 feet, and Lake Ontario 1.05 feet.

* * *

SCHEDULES of the steamship lines running from Chicago to outside points now are on Chicago daylight savings time, which is an hour ahead of central standard time, and all reports are being made on Chicago time.

* * *

THE proposal of the Goodrich Transit Co. to start operating a second boat between Chicago and Milwaukee, to supplement the services of the CHRISTOPHER COLUMBUS, has been abandoned for the present. It had been decided to have one of these boats leave Milwaukee for the Chicago trip at the same time the other departs from Chicago for Milwaukee, the vessels to cross paths enroute. The Chicago-Milwaukee runs will now be maintained as heretofore.

* *

BOAT schedules to Mackinac will be the same as during last summer. Daily services between Chicago, Grand Haven and Muskegon, Mich., were resumed on May 26.

Ocean Freight Rates

Per 100 Pounds Unless Otherwise Stated

Quotations Corrected to May 19, 1927 on Future Loadings

NOTE: FREIGHT RATES STEADY WITH BUT SLIGHT CHANGE

New York to	Grain	Provisions	Cotton (H. D.)	Flour	Genera cu. ft.	cargo 100 lbs.	††Finished steel	REMARKS Freight Offered
Liverpool	2s 3d	$0.60	$0.40	0.22	$0.50	$0.90	$8.00T***	Poor
London	2s 3d‡	0.60	0.40	0.22	0.50	0.90	8.00T***	Poor
Oslo	$0.18	0.45	0.50	0.30	0.42½	0.85	8.00T	Slow
Copenhagen	0.18	0 45	0.50	0.33	0.50	1.00	8.00T	Cood
Hamburg	0.15	0 55	0.50	0.23	0.50	0.90	10.00T	Good
Bremen	0.15	0.35	0.50 to 65	0.23	0.50	0.90	10.00T	Fair
Rotterdam and Amsterdam	0 15	0 32½	0.60	0.25	0.45	0.80	9.50T	Fair
Antwerp	0.14	0.32½	0.45	0.25	0.45	0.80	9.50T	Fair
Havre	0.16	0.55	0.50	0.30	0.45	0.80	9.00T	Quiet
Bordeaux	0.16	0.55	0.50	0.30	0.45	0.80	9.00T	Quiet
Barcelona	....	0.50	0.30	10.00 bags	—12.00T—		10.00T	Fair
Lisbon	....	0.75	0.50	8.00T bags	—23.00T—		8.00T	Fair
Marseilles	....	0.65	0.40	7.00 bags	—23.00T—		8.00T	Fair
Genoa	0.19	14.25	0.50	9.00	—23.00T—		11.50T	Fair
Naples	0.19	14.25	0.50	9.00	—23.00T—		11.50T	Fair
Constantinople	0.27	20.00T	0.85	0.40½	—24.00T—		11.50T	Fair
Alexandria	....	20.00T	0.85	0.40½	—24.00T—		11.50T	Fair
Algiers	....	0.85	0.60	0.45	—23.00T—		11.50T	Fair
Dakar	....	17.00	....	15.50T	—23.00T—		11.50T	Very good
Capetown	....	18.00	....	13.00	20.00		13.00 to 18.00	Fair
Buenos Aires	....	22.00T	....	....	20.00 to 22.00T†		3.00 to 8.80T	Poor
**Rio de Janeiro	....	22.00T	....	....	20.00 to 22.00T†		7.00 to 7.70T†	Poor
Pernambuco	....	22.00T	....	9.00T	—22.00T—†		9.70T†	Poor
Havana	0.30*	0.50	....	0.30*	0.61	1.33	10.00	Fair
Vera Cruz	0.25	0.30	0.35	0.25	0.52½	1.05	0.30 to 0.35	Fair
Valparaiso	....	1.07	....	0.70	....	....	10.00T	Fair
San Francisco	....	0.35 to 0.70	....	0.40 to 1.10	....	....	0.25 to 0-30	Fair
Sydney	....	18.00T	1.25	18.00T	18.00-24.00T		9.00 to 11.50T	Fair
Calcutta	....	....	....	10.00T	—16.00T—		10.00T	Fair

T—Ton. ‡Per quarter of 480 lbs. †Landed. ††Heavy products limited in length. *Extra charge for wharfage. **Plus $0.50 surcharge on all rates to Rio de Janeiro on account of congestion. ***Plus 15 per cent.

From North Pacific Ports to	Lumber Per m. f.
San Francisco	$4.50 to 5.00
South California	4.50 to 5.00
Hawaiian Islands	9.00 to 10.00
New Zealand	16.00 to 19.00
Sydney	14.00 to 14.50
Melbourne-Adelaide	14.00 to 15.00
Oriental Ports	11.00 to 12.00
Oriental Ports (logs)	14.50 to 15.50
Peru-Chile	13.50 to 16.00
South Africa	20.00 to 24.00
Cuba	15.00 to 17.00
United Kingdom	80s to 95s
United Kingdom (ties)	....
Baltimore-Boston range	$14.00 to 14.50
Florida Range	No rates
Buenos Aires	15.00 to 17.00
North of Hatteras	14.00 to 15.00
China	10.50 to 11.00
Jayan	9.50 to 10.50

Flour and Wheat	
U. K. and Continent (gross ton)	30s 0d to 32s 6d
Oriental Ports (net tons)	$4.25 to 4.75

NOTE: Lighterage rates on fuel in New York reduced from 6½ to 5½c per barrel. The coal strike in Britain is now settled and freight rates or bunker prices for coal or pig iron are again quoted.

General cargo rates to Havana change daily and are omitted for the time being.

Rates to Calcutta are subject to change without notice. Cotton goesonly to Bombay.

Principal Rates To and From United Kingdom

	s	d
Grain, River Plate to United Kingdom	28	0
Coal, South Wales to Near East	13	6
Coal, United Kingdom to Buenos Aires	13	0
Manganese Ore, Poti to Philadelphia	$3.95	

	s	d
Pig iron, United Kingdom to New York or Philadelphia	12	6
Iron ore, Bilbao to Cardiff	6	6
Iron ore, Huelva to Phila. or Balto	11	6

Bunker Prices

At New York

	Coal alongside per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
July 20, 1926	5.00@5.60	1.80½	6.08c
Aug. 12	5.00@5.60	1.81½	6.10
Sept. 18	5.45@6.00	1.81½	6.05
Oct. 22	7.25@7.50	1.70½	5.86
Nov. 19	7.00@7.50	1.81½	5.87
Dec. 20	6.25@6.50	1.81	5.86
Jan. 19	5.90@6.15	1.81½	5.87
Feb. 18	5.25@5.50	1.81½	5.95
Mar. 18	5.25@5.50	1.81¼	5.95
Apr. 19	5@5.50	1.75	5.71
May 19, 1927	5.65	1.81½	5.63

At Philadelphia

	Coal trim. in bunk per ton	Fuel oil alongside per barrel	Diese Eng. oil alongside per gallon
July 20, 1926	5.10@5.50	1.74@1.81½	5.09@6.15c
Aug. 12	5.00@5.25	1.69@1.74½	5.75@6.17
Sept. 18	5.00@5.35	1.74@1.74½	6.14½
Oct. 22	7.25@7.50	1.74@1.80½	5.66@5.88
Nov. 19	7.00@7.50	1.80½@1.81	5.43@5.88
Dec. 20	5.50@5.75	1.80@1.90½	5.64@6.19
Jan. 19	6.20	1.95@1.95½	5.88@6.19
Feb. 18	5.24@5.50	1.90@1.91	5.64@6.13
Mar. 18	5.24@5.50	1.95@1.95½	5.38@5.88
Apr. 19	5.15@5.65	1.81@1.86	5.38@5.64
May 19, 1927	5.15@5.65	1.75½@1.76	5.14@5.38

Other Ports

Boston, coal, per ton....$7.85
Boston, oil, f. a. s., per barrel....$1.86
Hampton Roads, coal, per ton, f.o.b., piers 42.25@4.50
May 10 — Cardiff, coal, per ton....14s 6d
London, coal, per ton...—s —d
Antwerp, coal, per ton..23s 6d
Antwerp, Fuel oil, per ton 80s0d
Antwerp, Diesel oil, per ton....95s 0d
British ports, Fuel oil...80s 0d
British ports, Diesel oil..95s 0d

Personal Sketches of Marine Men

Herbert C. Sadler, Dr. Sc., Professor of Naval Architecture, University of Michigan

By A. H. Jansson

AS DIRECTOR of the school of naval architecture and marine engineering at the University of Michigan since its inception 27 years ago, he has made an important contribution to better ship design.

HIS close contact with conditions in actual service through consulting work has given direct practical application to much of the work in testing models and to the theoretical studies carried out at the university.

HE BELIEVES that the naval architect should go beyond the attempt to obtain mechanical efficiency and that he should study the economics of the entire operation with the view of making that operation profitable.

ON JUNE, 10, Prof. Herbert C. Sadler, head of the department of naval architecture and marine engineering at the University of Michigan, will sail, with Mrs. Sadler from Montreal, for Glasgow where the degree of doctor of laws will be conferred upon him by the University of Glasgow. This honor coming from the first university to establish a civilian school of naval architecture and marine engineering is a significant recognition of the wide scope and high quality of the work done by Doctor Sadler.

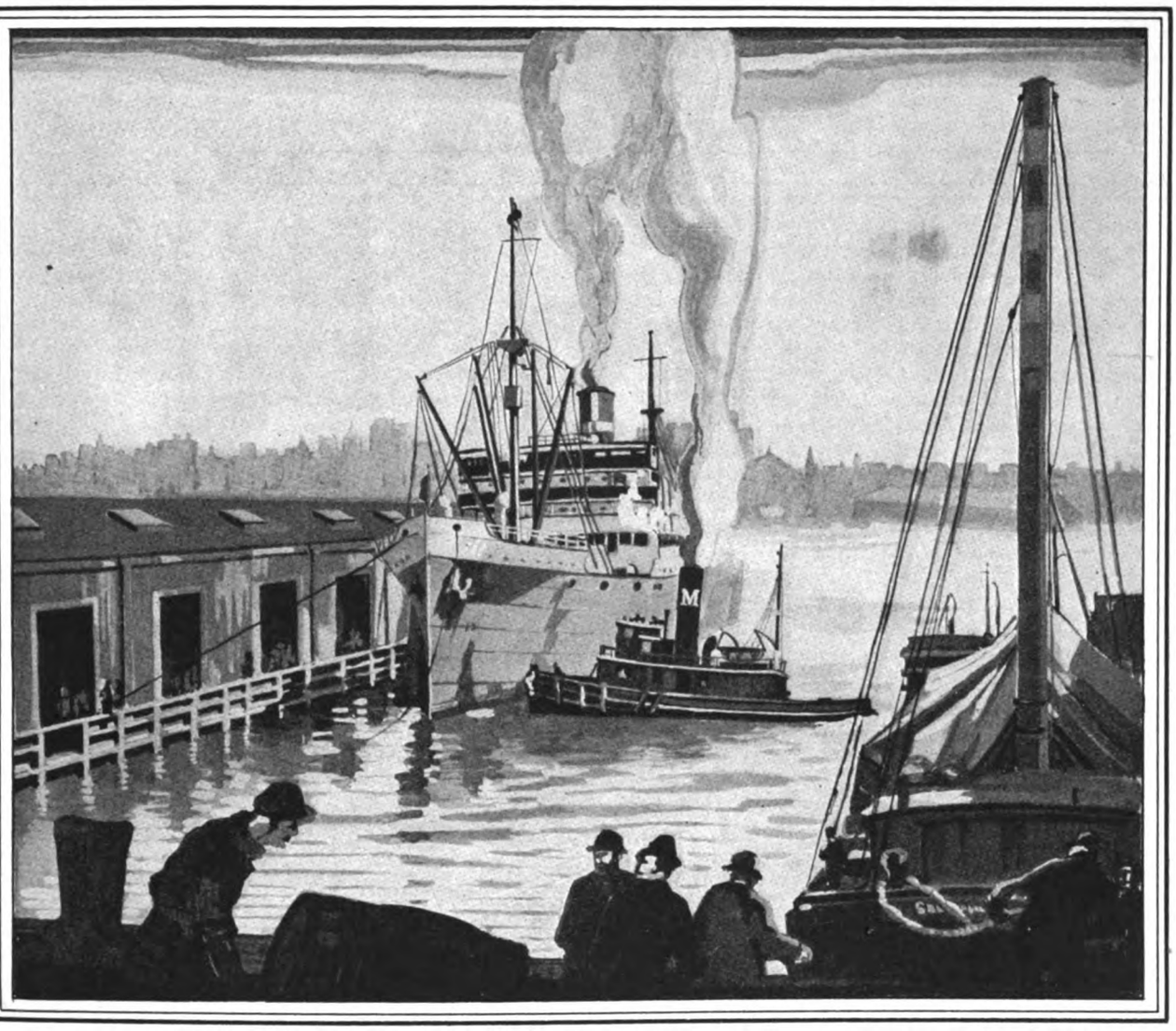
When the University of Michigan in the fall of 1900 decided to establish a regular course in naval architecture and marine engineering, Herbert C. Sadler, then 28 years of age, was chosen to take charge, a position he holds today with the added responsibility of being acting head of the course in aeronautical engineering. He was so youthful in appearance when he arrived at Ann Arbor, so the story goes, that a group of sophomores in one of their raids mistook him for a freshman. His appearance however belied his experience.

Born in London, Aug. 27, 1872, he was educated at Dulwich college, London, and at the University of Glasgow where he received the degree of bachelor of science in 1893 and the degree of doctor of science in 1902, two years after his appointment at Michigan. Right here it may be well to emphasize the fact that Professor Sadler is not merely a bookish academic student of his profession. His practical experience began 37 years ago in the summer of 1890, the year he entered the University of Glasgow when he enrolled as an apprentice in the firm of A. & J. Inglis, engineers and shipbuilders. Until his graduation he spent the winters and summers alternately in practical work as a shipwright and in all branches of steel, ship structural fabrication and erection and at his studies at the university.

After graduation he completed his apprenticeship in the drafting room and was employed in that capacity until 1896. He was then appointed as assistant to Sir John Harvard Biles, then professor of naval architecture at the university, and was lecturer in marine engineering. He was also associated with Professor Biles in his private work as consultant to many steamship lines.

Shortly after he went to Michigan, it was decided to build a model testing tank, and the design of this tank and the accompanying equipment was placed in Professor Sadler's charge. His research work has been largely in connection with questions relating to the resistance of ships, the results of which have been published in many papers read before various technical societies devoted to naval architecture and marine engineering, and appear also in most of the leading textbooks dealing with this subject. He has also contributed many other papers relating to the design and construction of ships, both to technical societies and the technical press.

Since his appointment as professor of naval architecture at the University of Michigan, he has also engaged in a general consulting practice, both in the United States and in Canada. He has acted as appraiser of vessel property for the state of Michigan, and consultant to many of the steamship lines, among which may be mentioned the Detroit and Cleveland Navigation Co.; the Huron Transportation Co.; the White Star line; the Hudson River line; the Canada Steamship lines; the Northern Navigation Co.; the Bradley Transportation Co., and the Goodrich Transit line. A number of the



The Serious Business of Proper Ship Handling—

—within the Port of New York is an intricate and highly specialized undertaking. Adequate equipment and facilities to meet the ever changing conditions of harbour congestion, tides, channeling, and other problems is as important a matter to those owners and operators who demand a comprehensive Service as the welfare of their vessels upon the high seas.

The Service of Moran, developed by three generations over a period of more than 65 years, has met every imposition for greater efficiency the intensive activities within the harbour has demanded.

Indeed, in many instances the capabilities of Moran Service has been the inspiration for much of the present day efficiency that is so characteristic of the Port.

Moran marine transportation engineers are available to owners and operators for consultation regarding towing or ship handling without obligation of any kind.

MORAN TOWING & TRANSPORTATION CO., INCORPORATED
17 BATTERY PLACE, NEW YORK
Whitehall 1340

MORAN Service

vessels for which he has been wholly or partly responsible, have been somewhat notable, such as the GREATER DETROIT, and the GREATER BUFFALO, the largest passenger vessels in the world engaged in inland water navigation, and the J. W. BOARDMAN and CRAPE, vessels designed for carrying cement in bulk. He was also responsible for the designs of all the vessels engaged in the ferry service for the city of Quebec, as well as some of the Detroit ferries.

Some years ago he carried out a series of experiments to determine the best and most economical form for vessels of the Great Lakes freighter type; and the final form developed is practically the standard of today. A number of the more important vessels have also been subject to his investigations, among which may be mentioned the WM. K. FIELD, CHAS. M. SCHWAB, T. W. ROBINSON and CARL D. BRADLEY, the electric drive stone vessels, the LEMOYNE and many others. In fact all of the shipbuilders of the Great Lakes have generally come to feel the advantages of the ship model tank at Michigan, and the valuable advice that they have obtained in the solution of many of their problems.

In public matters he has acted as consulting naval architect to the board of United States army engineers in connection with the question of transportation on the Mississippi river. This work included the development from tank tests, both in deep and shallow water, of the most economical types of towboats and barges, as well as experiments on radial and feathering paddle wheels.

For some years he has been a member of the technical advisory board of the American Bureau of Shipping. New York, and has recently been appointed chairman of the committee on naval architetcure for the Great Lakes district. He was also sent as a representative of this district to the international conference on the safety of ships, held in London in 1913. He was a member of the United States load line committee in 1920 and chairman of the Great Lakes section.

In this connection a very thorough investigation was made of the strength, stability and all other factors affecting the design and construction of lake vessels, with a view of determining to what maximum draft it was safe to load them. Looking to the future, this may have a very important bearing upon lake traffic if the general deepening of the channels should be undertaken. On the occasion of the EASTLAND disaster, Professor Sadler was called in by the federal government to investigate and report upon the reasons for the accident.

During the late war, he was engaged in the first stages with experimental work upon submarines, and methods of protection to merchant vessels. Later he was appointed consulting naval architect and engineer to the United States shipping board, Emergency Fleet Corp., and in this connection had charge of the engineering section which was responsible for the design and construction of all merchant vessels built during the war.

Recently he has been appointed consulting naval architect to the Canada Steamship lines, and in this connection is responsible for the new steamer ST. LAWRENCE which will go into service this summer, and two other new vessels at present building at the Davie yard, Que.

Professor Sadler was also responsible for the inauguration and development of the courses in aeronautical engineering at the University of Michigan, and is at the present time, the acting head of this department. He is a member of the Institution of Naval Architects, London; member of council, Society of Naval Architects and Marine Engineers, New York; member of Institution of Engineers and Shipbuilders, Scotland; member of Society of Automotive Engineers, New York, member of Michigan Engineering society, and of the Society for the promotion of engineering education. He is also a member of the honorary societies of Sigma Xi, and Tau Beta Phi and of the Masonic order.

He belongs to the following clubs: Detroit Athletic; Engineers, New York; Barton Hills Country club, and Ann Arbor Golf and Outing club; University club, Ann Arbor; and chairman of the Michigan Union.

If ever a man's heart was in his work Professor Sadler's is. Any problem in connection with the design or operation of ships engages his immediate and keen attention. He never tires of the subject. To him it is always new and ever interesting and absorbing. He is entirely unassuming and is approachable and of a social nature and takes a broad interest in the human side of student life and in the affairs of his community, state and nation.

Free Education Given in Naval Architecture

The Webb Institute of Naval Architecture will hold competitive examinations for free scholarships on June 21.

The institute owes its existence to the generosity of William H. Webb, a great New York shipbuilder in the Civil war period. It was so liberally endowed that accepted students obtain not alone free instruction, but free board, lodging and laundry during their entire four years of training.

Primarily the instruction given is naval architecture and marine engineering, but graduates are so thoroughly grounded in engineering studies that many of them enter the fields of electrical and mechanical engineering, and are filling many important places in these professions.

The board of trustees at its recent annual meeting, announced that hereafter a post graduate course in aeronautics will be provided by special arrangement with the Guggenheim school of New York University.

To become eligible to enter this competition young men must be American citizens not less than 16 nor more than 21 years of age, have an education equivalent to the average high school requirements for graduation, and submit letters of recommendation as to character. It is estimated that there are 15 vacancies to be filled.

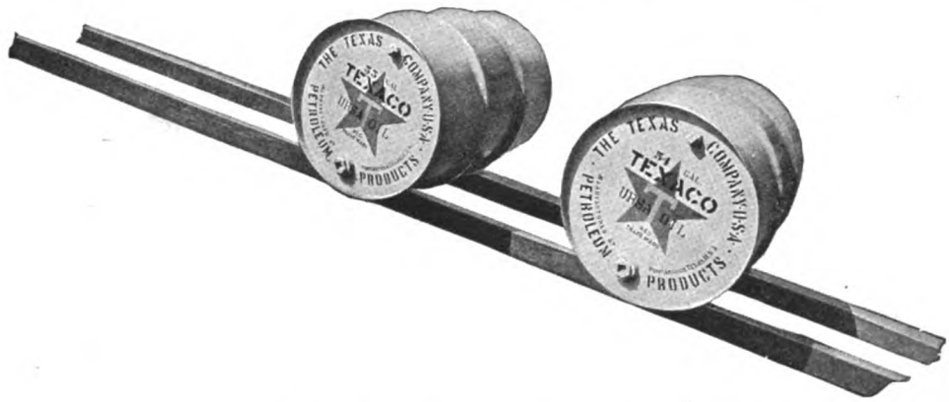
Candidates in and about New York will be examined at the Institute in Fordham, New York city. Candidates from other parts of the country may be examined at the nearest large city to their homes, by special arrangement.

Applications should be addressed to the Dean, Webb Institute of Naval Architecture, 188th street and Sedgwick avenue, Fordham, New York city.

At a regular meeting of the board of directors of the New York & Porto Rico Steamship Co., held April 27, V. K. Hull was elected first vice president, effective April 30 to succeed John E. Craig, who resigned to accept the first vice presidency of the Clyde and Mallory Steamship lines.

William Cramp & Sons Ship & Engine Building Co., Philadelphia, which recently announced its intention to abandon the building of ships, has appointed Edward M. P. Murphy Co. Inc., 165 Broadway, New York city, as agent to liquidate the real estate and equipment now devoted to marine construction and repairs.

Roll 'em Aboard!



There's more Lubricating ability in every barrel—and far less Carbon.

In the operation of the Diesel Engine, where lubrication must be positive and uniform, this is important; because any oil that forms hard carbon will produce high temperatures, destructive wear and loss of power.

TEXACO

URSA

OIL

for Diesel Engines

is pure and unblended. And because it contains no paraffine, leaves a surprisingly small amount of carbon; and *that* soft and fluffy.

Many of the world's Navies and Merchant Marines who are now using TEXACO URSA OIL highly praise its small carbon content and its dependable and economical lubricating qualities.

We, on our part, are so certain of the superiority of "URSA" for Diesel Engine lubrication that we earnestly entreat you to try it.

No matter what port you buy it at, each barrel of TEXACO URSA OIL will be found to be the same pure, clean, dependable lubricant for Diesels.

And remember: There is a Texaco lubricant for every purpose aboard ship.

We invite your inquiry regarding any Texaco Marine Lubricant and extend the fullest co-operation of our Engineering Department.

STOCKS KEPT AT PORTS THROUGHOUT THE WORLD

THE TEXAS COMPANY
MARINE SALES DIVISION
Dept. K6, 17 Battery Place, New York City
OFFICES IN PRINCIPAL CITIES

Superheat & Efficiency

(*Continued from Page* 15)

steam was used.

The savings shown above in dollars per year of operating cost do not represent the total advantages from the use of superheated steam. To them must be added the reduced maintenance and repair costs accruing through the unloading of steam generating equipment. With a reduced fuel consumption of more than 9 per cent there would be a corresponding reduction in steam consumption so that the condenser feed pumps and auxiliary machinery would be relieved of an appreciable portion of the duty under which they would have to operate with saturated steam. Unloading the boilers alone to an extent of 9 or 10 per cent would so relieve the intensity of firing, deterioration and the formation of scale as to be of tremendous advantage to the operator without showing directly in a reduction of the annual fuel bill.

A Record Cargo of Rye in Steamer Lemoyne

On April 21 the S. S. LEMOYNE of the Canada Steamship lines bound from Duluth, to Port Colborne, Ont., had on board 538,817 bushels of rye, weighing 15,087 tons, the greatest cargo of its kind ever carried by a Great Lakes freighter.

The S. S. LEMOYNE launched in August, 1926 is 630 feet long and has a beam of 70 feet, which is wider than any other bulk freighter of the lakes and can carry a greater cargo than any other ship, when loaded to the same draft.

Including this record cargo of rye, ships of the Canada Steamship lines now hold the record in five of the ten commodities listed by the Great Lakes Carriers association. The records are held by two ships, the LEMOYNE and the DONNACONA which until this year was known as the W. GRANT MORDEN, and are as follows:

Ore cargo in the DONNACONA, 1920, 14,137 tons; wheat in the LEMOYNE, 1926, 518,000 bushels; in the DONNACONA, 1919, 504,908 bushels; oats in the DONNACONA, 1915, 760,066 bushels; rye in the LEMOYNE, 1927, 538,817 bushels; mixed grain in the LEMOYNE, 1926, 551,000 bushels.

Although the steamer CARL D. BRADLEY which was launched April 9 at Lorain, O., is 8 feet longer than the LEMOYNE, her beam is five feet narrower. For this reason the LEMOYNE will continue to rank as the largest bulk freighter carrier of the Great Lakes.

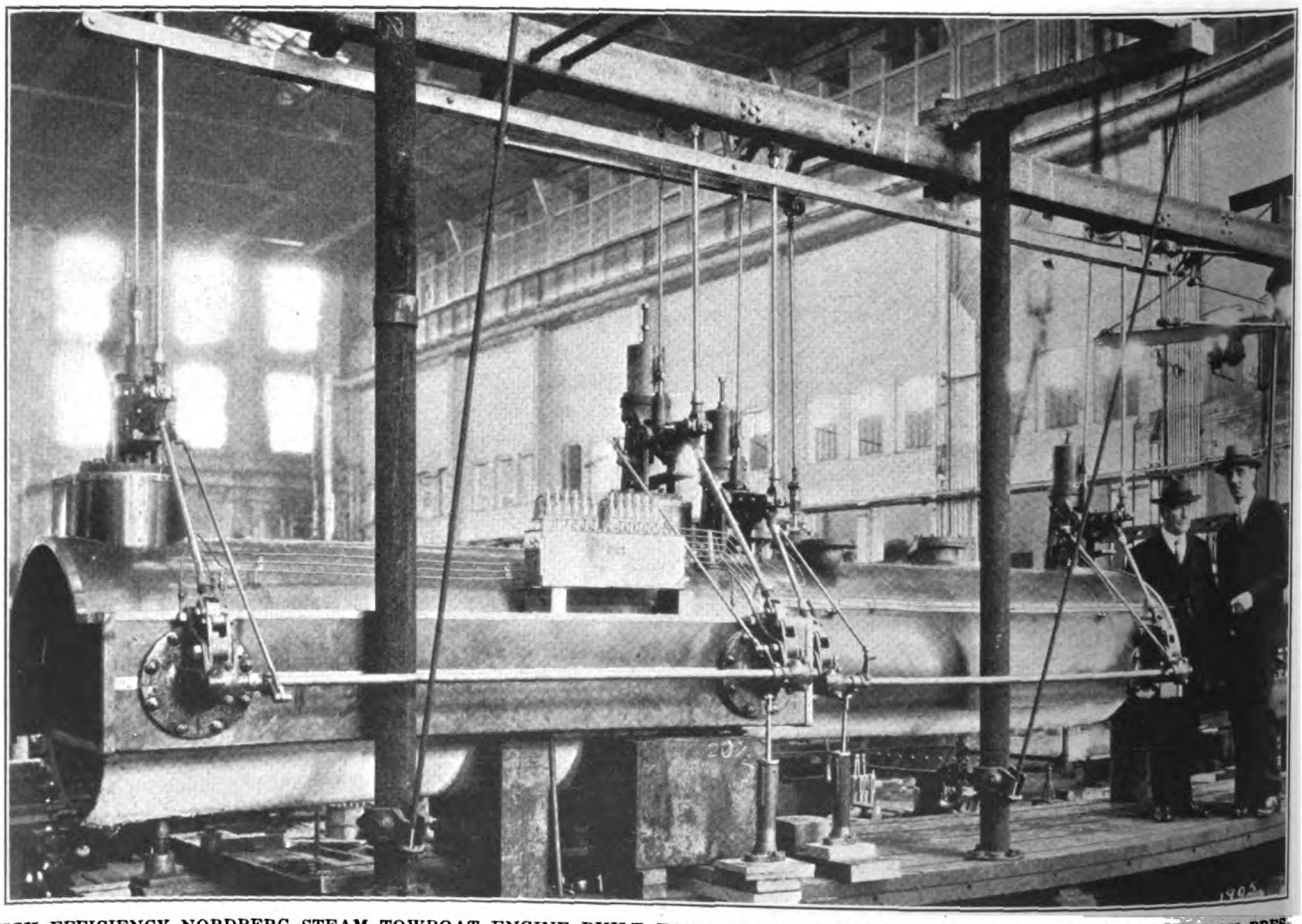
April Lake Levels

The United States Lake Survey reports the monthly mean stages of the Great Lakes for the month of April as follows:

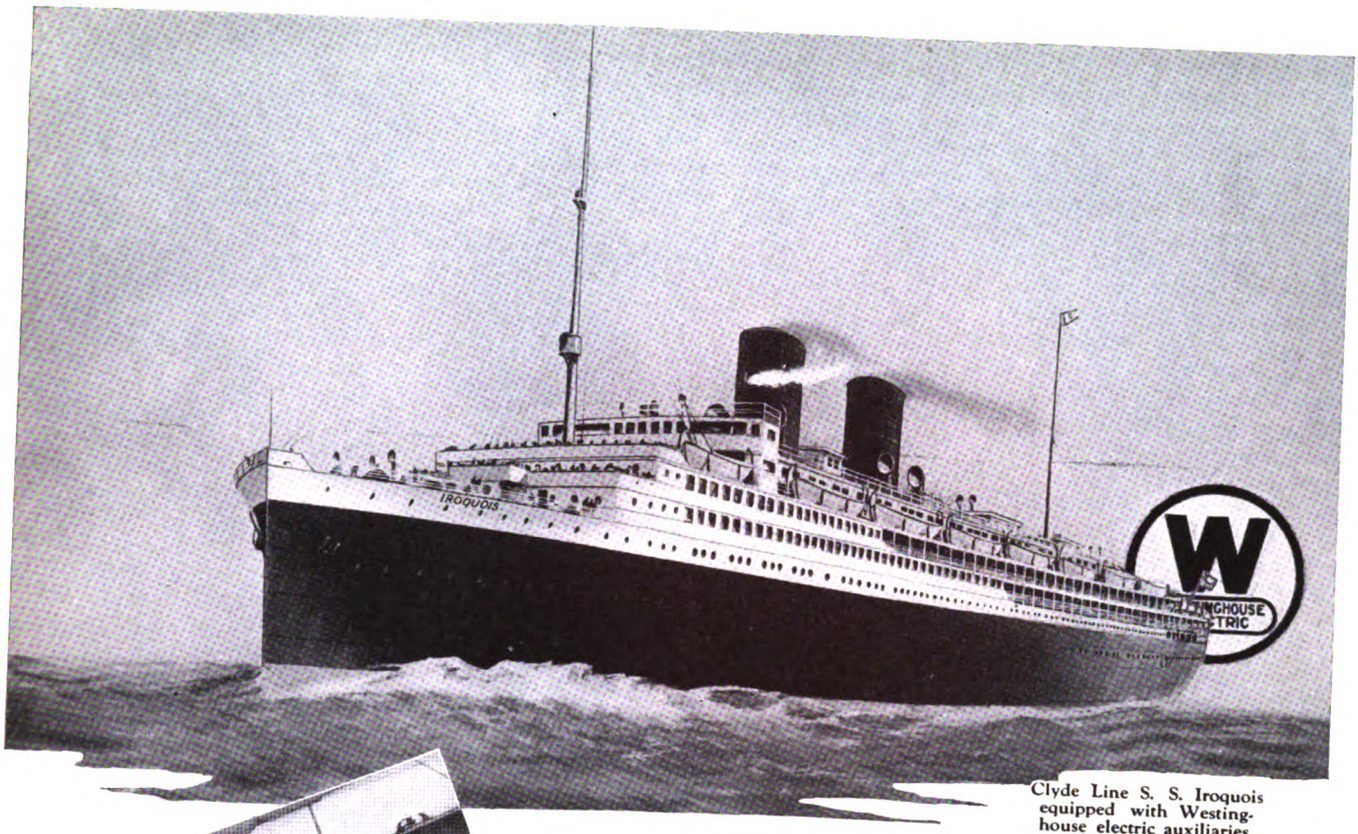
Lakes	Feet above mean sea level
Superior	601.41
Michigan-Huron	578.78
St. Clair	574.15
Erie	571.75
Ontaria	245.97

Lake Superior was 0.10-foot higher than in March and was 1.31 feet higher than the low April stage of a year ago. Lakes Michigan-Huron were 0.30-foot higher than in March and they were 0.96-foot higher than the low April stage of a year ago. Lake Erie was 0.65-foot higher than in March and was 0.94-foot higher than the low April stage of a year ago. Lake Ontario was 0.26-foot higher than in March and was 1.05 feet higher than the April stage of a year ago, 0.06-foot above the average stage of April of the last ten years.

The import movement in 1926 was approximately 44,800,000 tons.

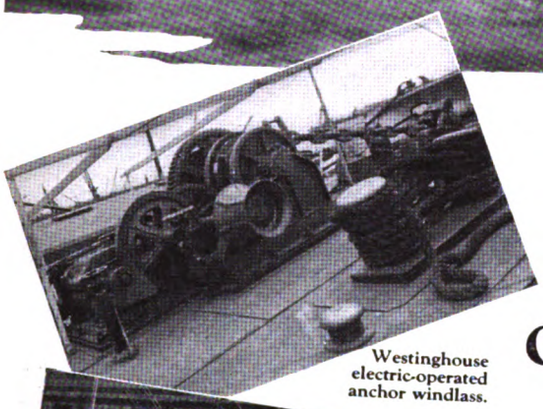


HIGH EFFICIENCY NORDBERG STEAM TOWBOAT ENGINE BUILT FOR UPPER MISSISSIPPI BARGE LINE—RIGHT HAND HIGH PRESSURE AND LOW PRESSURE CYLINDERS—SHOP VIEW AT NORDBERG MFG. CO., MILWAUKEE, WIS.—TWO UNITS OF 600 BRAKE HORSEPOWER AT 17 REVOLUTIONS PER MINUTE IN EACH BOAT—THREE BOATS IN ALL

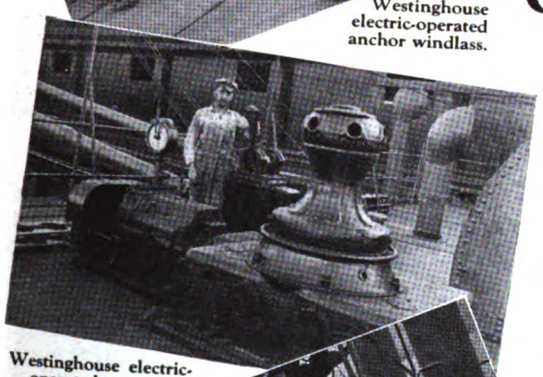


Clyde Line S. S. Iroquois equipped with Westinghouse electric auxiliaries.

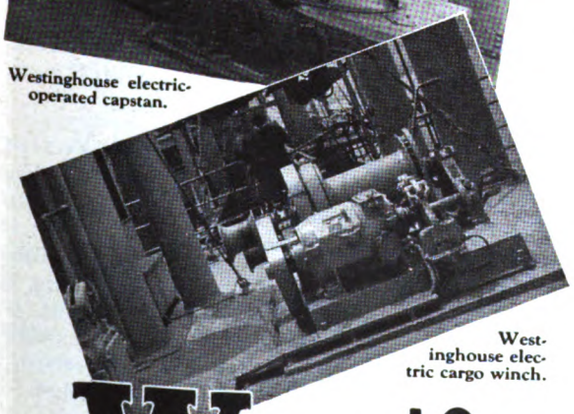
Clyde Line Proves *Economy* of Electric Auxiliaries



Westinghouse electric-operated anchor windlass.



Westinghouse electric-operated capstan.



Westinghouse electric cargo winch.

ECONOMY—that's what the shipping industry is looking for today. And it's the reason the Clyde Line equipped their steamships Seminole and Cherokee with Westinghouse electric drive on all deck auxiliaries three years ago.

These installations were immediately successful. They proved conclusively the reliability and greater economy of Westinghouse electric auxiliaries on steam-driven ships. The prevention of cargo damage alone from leaking steam lines and heat justified the change of equipment.

Now Westinghouse electric deck auxiliaries and generating sets are standard on Clyde Line steamships. Since the two original installations were made, four new Clyde Line ships have been built and all are equipped with Westinghouse auxiliaries.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal American Cities
Service Stations in Principal American Ports

Westinghouse

X92780

Equipment Used Afloat

(*Continued from Page* 39)

of this cup entirely satisfactory.

The value of proper lubrication cannot be over-emphasized. To obtain proper lubrication three elements are involved: 1. Proper care on the part of the operating engineer; 2. Efficient mechanical means for distributing the lubricating oil in correct amount to the parts requiring lubrication; 3. A good quality correctly prepared lubricating oil of the proper ingredients and weight for the particular kind of lubrication it is called upon to perform.

Each engineer must consider carefully the practice of running water on crank pin bearings and eccentric bearings to keep them properly cool. In our modern development along all lines the science of lubrication has not been neglected. It is, therefore, possible to keep bearings cool with the right kind of lubrication, with less wear, without water than with it. When using water it is difficult to determine just how hot the bearings surface may be and this is a source of danger.

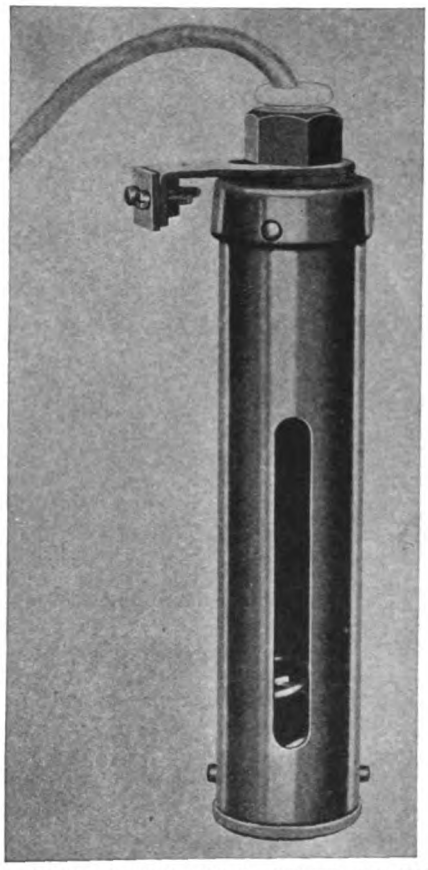
The wiper cup described in this article and illustrated is not patented and its use is open to any ship or any engineer who has had any difficulties with his lubrication due to the causes mentioned above. Further information in regard to this new type of wiper cup may be obtained by communicating with the editor of MARINE REVIEW.

New Boiler Gage Light Resists Vibration

A boiler gage light, consisting of a tubular reflector with a bayonet attachment to the socket flange, has been designed and is being manufactured by the Westinghouse Electric & Mfg. Co. A compression spring serves to maintain the connection and to hold the lamp in place, so that neither the reflector nor the lamp can loosen under vibration.

The design of the boiler gage light permits mounting on the guard rail of any boiler water gage or on the end of a ½-inch conduit used to carry wiring to the reflector. This mounting may be accomplished by the use of a screw driver. When it becomes necessary to change the lamp, no tools are needed to remove the reflector because one turn of the reflector disengages the bayonet attachment, and the lamp can then be screwed out of the standard socket.

The reflector is made of heavy brass tubing with a slot in one side to throw the light on the water gage only. The reflector is easily adjustable for any desirable height and the mounting brackets are arranged to accommodate a wide range of positioning of the guard rods with relation to the gage. Four feet of two-way



A NEW BOILER GAGE LIGHT WHICH RESISTS VIBRATION

conductor cord and an attachment plug are furnished regularly with the boiler gage light. A standard tubular mazda B lamp with T-10 bulb should be used.

New Type Mortising Tool Electrically Driven

Every self contained shipyard or ship repair plant must have its joiner shop in order to carry out the very important wooden construction in outside and interior finish on board ship.

It is therefore of interest to describe a new portable electrically driven lock mortiser developed by the Wappat Gear Works, Pittsburgh. This novel device, it is said, can be operated by inexperienced men and cuts the time for mortising on doors and windows to one-thirtieth of the time previously required. With this motor driven mortiser the ordinary mortise can be cut in one minute.

The outstanding feature of this machine is its simple construction and ability to be carried from place to place wherever it is needed. This electric device is carried to the scene of the operation and clamped on the window or door in which the mortise is to be cut. These clamps are self-centering and have wood face mountings to prevent defacing of doors. An adjustable collar governs the size of the mortise and enables the machine to be used on all sizes of jobs. The cutters themselves are of the two-lipped type, of high speed steel and are provided with spindles for clearing away the chips. Easy running of the machine is assured through the use of a flywheel which governs the speed of the cutter.

Ample protection is provided for operator. All gears are enclosed and the driving belt is well guarded. This is essentially important due to the fact that the design of the machine enables inexperienced men to

ELECTRIC MORTISER CUTTING MORTISE ON DOOR

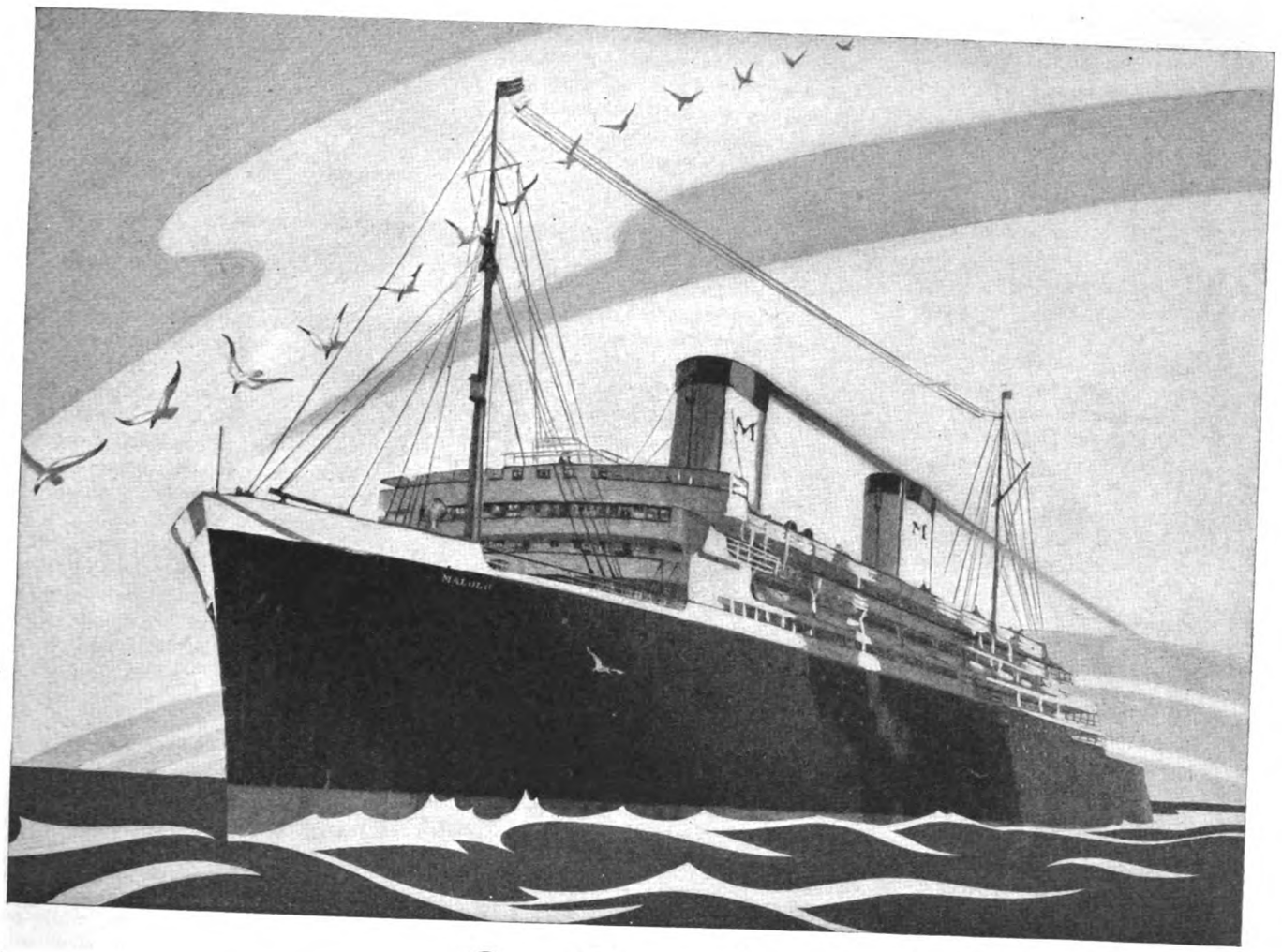
operate it, thus affecting a great saving in expense and eliminating the necessity of training men to perform the work.

This portable machine is driven by a Westinghouse one-eighth horsepower motor, is sturdy and compact in construction and has a wide variety of applications in industry. It is particularly useful in apartment, office building and shipyard work.

Ship Autos by Water

A shipment of 14,288 fully assembled automobiles from Detroit during the period from March 15 to April 30, is reported by the Nicholson Universal Steamship Co. The gross freight revenue during this period amounted to $166,346. Shipments were made mostly to Cleveland, Buffalo, Chicago and Milwaukee.

The CITY OF RAYVILLE was allocated to the Roosevelt steamship line and sailed for Australia May 10.



THE *S. S. Malolo* is completely Exide-equipped

These dependable batteries handle every storage battery job on the largest American-built liner . . . .

STORAGE batteries handle some important jobs on the new S. S. Malolo—and every one of these batteries is an Exide.

One Exide insures unfailing current for emergency radio service.

A second battery is prepared to operate the emergency lighting system.

Another Exide operates the loud-speaking telephone system. And a fourth Exide supplies current for the interior communication system of the big ship.

For whatever purpose they are used, Exide Batteries can always be counted on to give absolutely dependable service throughout a long, active life. That is why they have been installed on the S. S. Malolo.

They are one of the many precautions which the Matson Navigation Company has taken to insure the maximum of comfort and safety for the passengers of what is probably the most perfectly appointed—and certainly the largest American-built—liner afloat.

There is an Exide representative in nearly every important coast and inland port, who will be glad to call and discuss Exide Batteries for radio and other marine purposes.

Just write to this office. ***The Electric Storage Battery Company, Allegheny Ave. & 19th St., Philadelphia. Exide Batteries of Canada, Limited, Toronto.***

Exide

BATTERIES

FOR EVERY MARINE USE

Cargo Handling Costs

(*Continued from Page* 37)

have just installed special machines for the direct transfer of grain from box cars to lighters alongside of the pier.

Bulk building materials such as sand and gravel, gypsum, etc., are handled by grab-bucket hoists of either the tower or mast-and-gaff types.

An extremely interesting development of the past few years has been in the handling of common building brick. Breakage and the necessity for stacking to economize in space required hand labor almost exclusively, but two methods recently developed practically abolish hand labor. One uses a container and cranes and is used where bricks are shipped in gondola cars, while the other uses no container but requires the bricks to be specially stacked so as to be handled by a special crane and tongs. This method is used for bricks coming in by lighters or barges. The first method used steel containers with doors at top and bottom each holding 3000 bricks. Twelve of these containers fill a special gondola car, and they are loaded at the brickyard while standing on the car. On arrival at New York the car is spotted under a gantry crane and an auto truck with a 3000-brick-capacity body runs alongside. The crane spots a container over the auto truck and the bottom doors are slowly opened by a second hook on the crane, thus depositing the brick in the truck gently and with little breakage. The container is then dropped back in the gondola. Twelve containers can be unloaded in about 45 minutes, whereas to unload a box car containing fewer bricks by the old hand method took from one to one and a half days. A single crane operating ten hours a day could unload in one day enough bricks to build 60 per cent of one wall of a building 300 feet high and 100 feet long, allowing for a normal number of window openings. This method of handling greatly reduces the cost, gives better service, and enables the railroad to handle the business with fewer cars and storage tracks.

For the lighter or barge method the green bricks are built in special stacks as they come from the molding machine, and these special stacks are maintained intact throughout the manufacturing process and until delivered to the building contractor. Each stack contains about 1500 bricks, and one or two stacks make a truck load, depending on the truck size. After manufacture is completed the crane with the special tongs loads the bricks on the barge by stacks, and at the New York end they are unloaded by similar cranes for delivery direct to trucks or to a storage pile where the stacks are still maintained intact. This permits piling 90 bricks high instead of 22, the economic limit by hand methods. Much ground area for storage is thus saved. Three hundred thousand bricks have been handled from barges to trucks in a day. One concern formerly required seven barges to handle their business with hand methods, whereas they now give better service with three. These methods represent a real advance in the art of mechanical handling of material.

Lumber is to a large extent being handled by machinery, usually cranes with special hooks, although there are possibilities of further improvement in handling of this material.

Methods Used For Package Freight

Now, turning to package freight, this falls into two general classes, viz., large packages weighing over 3000 pounds, and small packages weighing under 3000 pounds. While package freight does not lend itself to mechanical handling as readily as bulk freight, an immense tonnage is being handled very largely by mechanical means in the port, and the use of machinery has been increasing rapidly within the last few years. As long as the port remains to a large extent a lighterage port, floating cranes and derricks will be necessary, and a survey shows that there are 224 lighters equipped with power hoists of from 5 to 60 tons capacity. There are several larger than 60 tons for exceptionally heavy freight. While charges for the use of these heavy-capacity floating derricks are high and much time is consumed in towing them to and from the point where used, it is questionable as to whether many piers could justify the cost of a high-capacity pier crane to handle the tonnage of heavy freight passing over them, especially when the expense of foundations and redesign of pier are taken into consideration.

A number of piers have been especially built and equipped within the last few years for handling heavy packages up to about 20 tons such as boxed automobiles, knocked-down locomotives, boilers, etc. On one such pier the replacement of eight steam locomotive cranes with four heavy-capacity electric cranes reduced maintenance and labor costs by 55 per cent each, and the overall cost of operating the pier was cut in half. On another of these piers with two electric traveling cranes handling principally boxed automobiles, it was reported that the cranes avoided all shifting of barges with consequent delay and expense of tugs, and that the capacity of the pier had been increased approximately three times over the old method of using steam-operated locomotive cranes. There are at the present time close to fifty electrically operated cargo jib cranes of between 2½ and 20 tons capacity in the harbor, the majority of which have been installed since the war. In addition to this the railroads are equipped with pillar or gantry cranes for handling heavy loads between cars and trucks. Thus material progress has been made in the use of heavy package-handling machinery and economies are being effected.

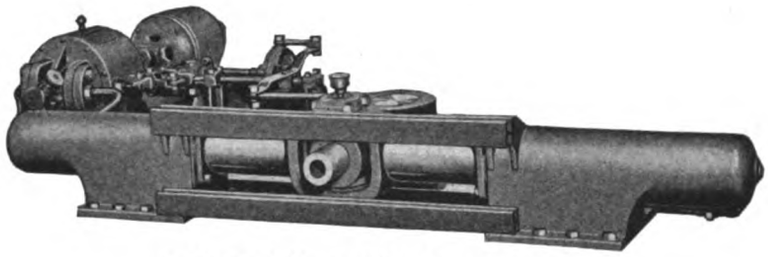
Turning now to light packages, ships winches, supplemented at times by dock winches, are still in general use for loading and unloading ships. While there may be disadvantages to this method, the change to other methods will be slow for the reasons pointed out in the first part of the paper. However, improvements have been made in handling methods on the piers by the use of electric trucks and tractors with trailers, conveyors, piling machines, and power ramps. The economical use of this type of machinery is, however, handicapped by the size of many piers, while on others the short average movement does not justify their use; thus their universal use cannot be expected for many years. Several of the railroads have made quite extensive use of electric trucks and trailers on their pier stations for handling car ferries, with very efficient results if statements as quoted below are typical. One superintendent writes:

Mechanical Aids for Light Packages

"This freight-handling equipment has made a reduction in handling cost and almost eliminated dock shortages and misloading. One of its great advantages is that freight is practically cleaned up at all times. This makes it possible to get floats away from the piers a few minutes after closing time for the receipt of freight. One of the advantages to shippers is the fact that there is practically no delay in releasing shippers' trucks at bulkheads. It is noticeable that the congestion which used to exist in front of railroad freight piers no longer exists when electric trucks are used, and in this way the truck operation has perhaps benefited the shipping public even more than the railroad."

Another superintendent wrote as follows regarding the use of tractors and trailers and electric lift trucks with skids.

"The principal advantage of the mechanical equipment applies to the handling of forwarded business in



A-E-CO Electro-Hydraulic Steerer

No Hydraulic Steerer Can Be Better than Its Pump.

In the steerer shown below the Hele-Shaw high-pressure pump provides tremendous power under instant, perfect control.

The discharge of the pump is *reversible*, which makes it possible to install a follow-up mechanism of extreme simplicity.

The pump itself is direct-connected to a constant speed electric motor and always rotates in the same direction at the same speed, regardless of the amount and direction of the discharge.

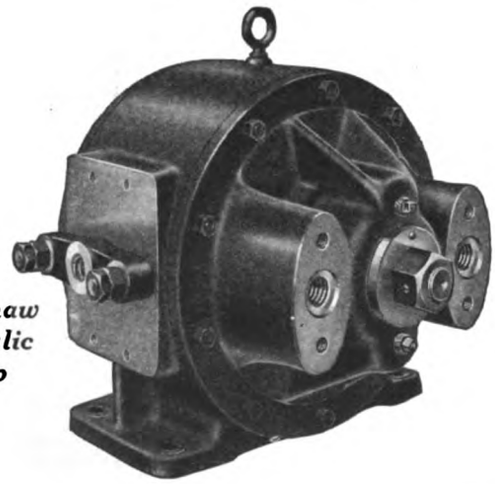
There are no complicated electrical controls.

Write for information.

American Engineering Company

Kensington Station

Philadelphia, Pa.



Hele-Shaw Hydraulic Pump

that it avoids docking and reloading such freight, with the result that less man-hours are necessary and the bulkhead is kept open for the continuous receipt of freight, thus reducing truck detention. The equipment now in use has greatly contributed to efficient operation, making possible the handling of greater volume of business through the same pier facilities at reduced labor cost. At our largest pier, with very slight increase in facilities, it was possible to increase tonnage handled per annum approximately 50 per cent. Without the mechanical equipment this increased volume of business could not have been handled and our labor cost would have been approximately five cents per ton greater than present cost."

He further states that this estimate on labor cost is very conservative. In another case it was reported that the use of electric trucks carrying small cranes had cut in half the labor required on the pier when handling certain classes of freight. No figures were available on the number of piers, railroad terminals, and warehouses using power trucks and tractors, but their use has spread rapidly within the past six or eight years, and has probably been as fast as economic conditions would permit.

Install Power Ramps

Power ramps have been put on a number of piers unloading from lighters, barges, and side-port vessels where tide and draft conditions make the grades too steep for one man to handle a hand truck and where the operating conditions on the pier are such that electric trucks cannot be efficiently used. On one such pier which is working up to capacity every day with night work part of the time, these ramps reduced the direct labor 33 per cent and the time of climbing the ramps was cut in half. The same type of power ramp is used on some piers between the first and second stories to replace elevators, but no statistics are available to show the economies of one over the other.

Many warehouses are now using electric trucks with elevator service between floors, but here again there was not time to collect statistics on the savings effected thereby, although their increasing use indicates a saving. This method of operation is replacing the whip hoists for hoisting from ground to upper floors, which method requires trucking from ship or car to hoist, hoisting to upper floor, and trucking to destination. The electric-truck and elevator method maintains the load intact on the truck from ship or car to destination.

Various types of containers are coming into more general use not only on railroads but in department stores for the delivery of goods and the transfer of goods between warehouses and retail stores. The size of these containers requires power equipment, usually small electric hoists, to handle them.

The detachable-body auto truck with increasing capacities is coming into more general use, thus permitting the expensive power plant and chassis with its operator to be kept more continually at work.

Conveyors of the power and gravity type are finding more general application for both bulk and package freight in manufacturing plants where the flow is sufficiently continuous to justify their installation and use. Pilers and stackers are economizing in expensive floor space by permitting higher piling with less labor. Small power hoists are being installed in large numbers, whereas few were used ten years ago.

It can safely be said, as a general thing, material-handling machinery tends to create dispatch instead of delay, to bring order out of chaos, and to reduce the required area per ton handled.

The entire material-handling branch of industry is being put on a firmer foundation by the accumulation of statistics and experience, and a committee of the American Society of Mechanical Engineers has worked out a formula for calculating the economies resulting from the use of power-driven material-handling machinery.

To sum up, the port of New York has progressed and will continue to progress in this field in spite of the conditions referred to previously in this paper, because competition and labor shortage will compel such progress. The rate of this progress will be governed very largely by economic conditions and laws, but it will be accelerated to some extent by the acquisition of more complete knowledge on the application and use of mechanical devices.

Recent Sales of Ships

The United States shipping board has approved the sale or reconditioning of the following government merchant tonnage:

ABSAROKA, steel, steam, single screw, coal burning freighter, to the McCormick Steamship Co., San Francisco for the sum of $131,000. Twenty-five per cent of the price was paid in cash and the balance in ten equal annual installments. The purchaser will convert the vessel to be an oil burner.

CONTOOCOOK, steel, steam, single screw, cargo vessel of 3630 deadweight tons, burning coal, designed to steam at 9¼ knots, to the Cosmos Steamship Co. Inc. for the sum of $36,000.

FIVE FORD VESSELS among those purchased from the shipping board for scrapping purposes may be converted to barges with approval of the shipping board, on the additional payment to the board of $10,000 for each vessel thus utilized. The vessels are all of the lake type and were purchased from the board for $8530 each. The Ford Motor Co. is making an elaborate conversion spending approximately $125,000 on each vessel. Each vessel will be completely dismantled and fitted up with donkey boilers and donkey engines but with no propelling power and will be used in handling bulk material needed by the Ford company. The tugs bought from the shipping board will be used for towing these barges.

World Markets

ARABIEN, double deck steamship, 8720 deadweight, 4714 gross tons, for about £37,500 to Globus Reederei Aktienges, Bremen.

ELEVEEN, single deck steamship, 2616 deadweight tons, 1687 gross tons, for about £22,000 to W. Swanston & Sons, Newcastle-on-Tyne.

ORMUZ, three deck steamship, 10,500 deadweight tons, 15,588 gross tons, for about £300,000 to Norddeutscher Lloyd, Bremen.

TRANSVAAL, single deck steamship, 7250 deadweight tons, 4395 gross tons, for about £37,500 to Nordeutscher Lloyd, Bremen.

ADMIRAL DE RUIJTER, single deck steamship, 8300 deadweight tons, 5545 gross tons, for £19,000 to Schulte and Bruns, Emden.

John G. Euson, district manager of the Luckenbach line at Portland, has been appointed district manager at Seattle, succeeding Paul D. Chandler, who has resigned. T. G. Maddox, district freight agent at Los Angeles, has been transferred to Portland as district manager there. W. G. Perow, formerly port engineer at San Francisco, has been appointed port superintendent, with jurisdiction over all terminals and ships.

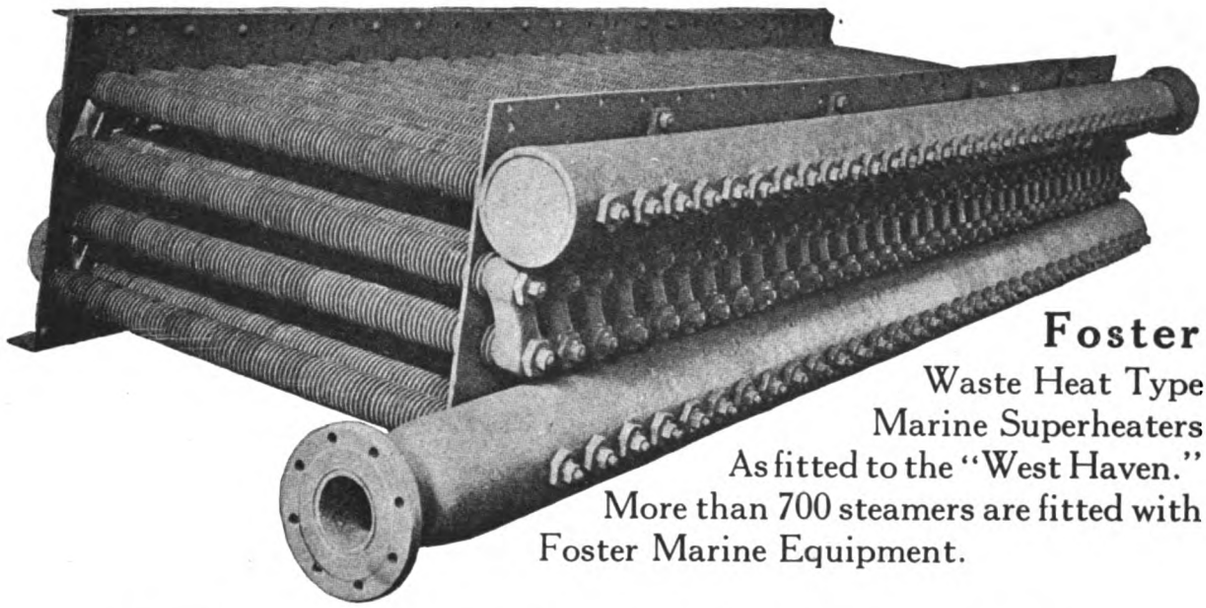
Appoint Vice-Presidents for Merchant Fleet

Under the recent re-organization plan of the Merchant Fleet Corp. proposed by President A. C. Dalton and approved by the shipping board, there will be two vice presidents.

J. Caldwell Jenkins has been selected to be vice president for administration, while E. A. Kelly, the present director of the operations department of the Merchant Fleet Corp. was made vice president for operations. Both of the appointments were approved by the shipping board on April 26.

The vice president for administration will be concerned with all the administrative and fiscal affairs of the corporation and will have direct supervision of the executive department, the finance department, the comptroller's department, the insurance department and the secretary's office.

Mr. Kelly, vice president for operations will direct all physical activities of the corporation which will include the traffic department, the operations department, the supply department, and the United States lines. The entire fleet of shipping board vessels including active and inactive ships have been placed under the administration of the operating department reporting to the vice president for operations. The ship sales department will report to the vice president for administration.



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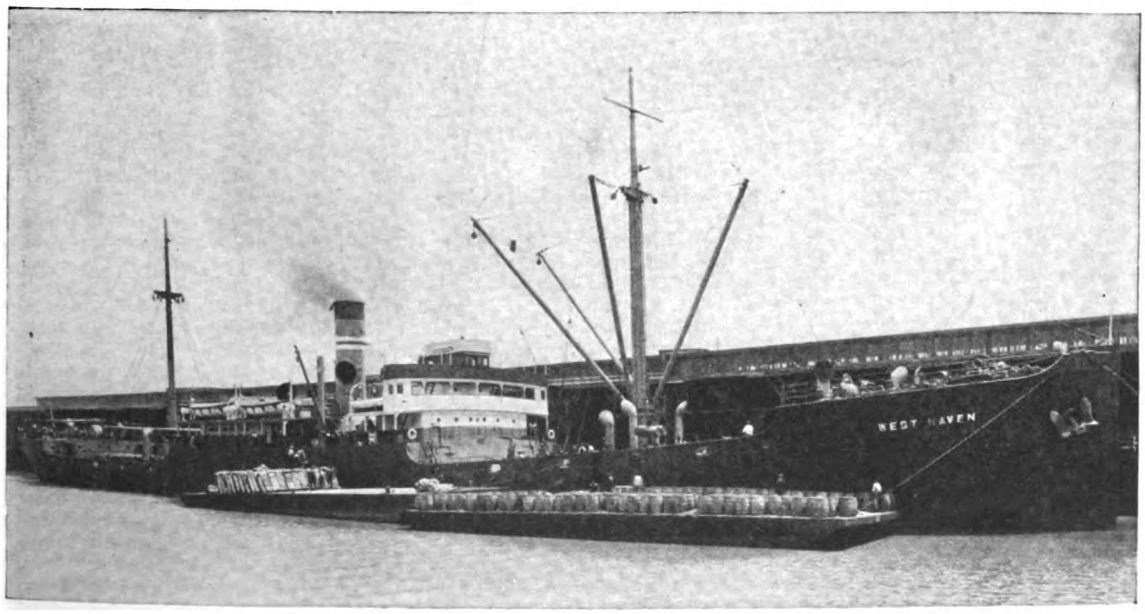

S. S. West Haven—Savannah, Ga.—May 1927.

New Trade Publications

PROPELLERS OF BRONZE—The Columbian Bronze Corp., Freeport, Long Island, N. Y., has just issued a new catalog entitled "Propellers in a Nut Shell." This catalog deals with a full line of Columbian propellers which has been developed by this company after 25 years' experience. Propellers for all types of services are described from the tiny ones used in attached motor boats to those in the largest ocean liners. Characteristics of propellers are discussed simply and clearly. The effect of diameter, shape and blade area is pointed out for various services and types of boats. The booklet is of 36 pages and is illustrated with cuts of propellers and boats. There is a price table given for smaller sizes of propellers, also table giving characteristics for propellers of different diameters. A table of speed for pitch and revolutions is also given, and a table for the size of three-bladed propellers based on the horsepower and the number of revolutions.

PULVERIZERS—Raymond Bros. Impact Pulverizer Co., Chicago, has issued a catalog describing its automatic pulverizers with air separation. These machines are manufactured in several sizes and may be used in grinding various materials.

WELDING EQUIPMENT—Smith Welding Equipment Corp., Minneapolis, has issued a 55-page catalog showing the line of welding equipment manufactured by this firm. Welding and cutting outfits, generator outfits, torches, tips, preheating torches, regulators, etc. are described. Illustrations of each type of equipment assist in visualizing the particular part.

PYROMETERS—Bristol Co., Waterbury, Conn., has issued a pamphlet describing its pyrometers and core oven recording thermometer. The pyrometers are of either the wall type or portable type, and the fire end of the thermocouple for obtaining temperatures of nonferrous metals has two separate wires which may be replaced without disturbing the remainder of the couple. The metal bath forms the junction between the wire elements.

STEAM TRAPS—Sarco Co. Inc., New York, is distributing a memorandum book to call attention to the features of its self-adjusting steam trap.

ACETYLENE GENERATORS—Air Reduction Sales Co., New York, has issued a section of its catalog on generators for acetylene gas production, standard and portable. The various types are illustrated and data given.

HIGH-TEMPERATURE CEMENT—A booklet by the General Refractories Co., Philadelphia, covers its high-temperature cement, with many illustrations to show its resistance to high temperature and other properties. Directions for its use to obtain best results are given.

SLING CHAINS—S. G. Taylor Chain Co., Chicago, has issued a leaflet listing its types of sling chains, prices and safe loads at various angles.

STEEL LOCKERS—Durabilt Steel Locker Co., Aurora, Ill., has issued a loose-leaf catalog of its product, containing description of the various types of lockers, with drawings of construction details and much other valuable material. Considerable text is included for the purpose of aiding the user of lockers to choose types and styles, as well as arrangement of locker rooms. Color plates aid in decorative achievement.

HOT-OIL PUMP—Wilson-Snyder Mfg. Co., Pittsburgh, has published a bulletin on its pump designed to move oil at 800 degrees and also for lower temperatures. Ruggedness of construction to withtstand high temperature is shown and described.

ARC WELDING SETS—Constant-potential arc welding sets as manufactured by the General Electric Co., Schenectady, N. Y., are described and illustrated in a current bulletin. The set is self-contained and will supply current for any number of operators up to its capacity for metallic or carbon electrode welding. Assembly, wiring and panel layout are included in the illustrations.

NAUTICAL CATALOG—An interesting booklet has been prepared by the McNab Corp., specialists in nautical and engineering appliances, on what is called a dial-o-meter. This is a tank gage for land and marine use for indicating the fore and aft draft of ships; for measuring contents of fuel oil, ballast water, and other tanks. It may also be used for determining the maximum and minimum water levels in rivers and harbors.

CHAIN SLINGS—Stressing the importance of proper slings and hooks for use with chain hoists, Herbert Morris Inc., Buffalo, N. Y., has issued a leaflet describing its adjustable slings for various uses, each adapted to the particular problem presented in lifting various calsses of burden with safety and efficiently.

TRAILERS—Clark Tructractor Co., Buchanan, Mich., has issued a catalog of its trailers for industrial haulage with tractors, showing various types for different uses and details of construction and operation. It is well illustrated.

PUMPS—Dunning Pump & Mfg. Co., Philadelphia, has issued a bulletin describing a two-cylinder pump just added to its line.

Business News for the Marine Trade

Motor Tug I and Motor Tug II have been incorporated at New York for $15,000 and $45,000, respectively, by J. L. Aronson, O. Haakonsen and J. A. Lyon. Carmody, McLaughlin, Easterday & Otto, 2 Rector street, are attorneys.

Ipswich Steamship Corp., New York, has been incorporated with 2000 shares no par value by H. C. Hand, R. J. Gorman and S. C. Wood. J. R. Vanhorne, 67 Wall street, is attorney.

Viking Towing & Transportation Co., New York, has been incorporated with $50,000 capital to operate steam and sail boats by J. L. Aronson, O. Haakonsen and J. A. Lyon. Carmody, McLaughlin, Easterday & Otto, 2 Rector street, are attorneys.

Steamer Cedarhurst Corp., New York, has been incorporated with $100,000 capital by G. V. Reilly, W. M. Stevens and H. C. Hand, to operate steam vessels. Crowell & Rouse, 24 Broad street, are attorneys.

Kobul Steamship Corp., New York, has been incorporated with $100,000 capital to operate steamships, by W. M. Stevens, H. C. Hand and G. V. Reilly. Crowell & Rouse, 24 Broad street, are attorneys.

Steamer Castana Corp., New York, has been incorporated with $100,000 capital by H. C. Hand, S. C. Wood and W. M. Stevens, to operate steam vessels. Crowell & Rouse, 24 Broad street, are attorneys.

Steamer Vaba Corp., New York, has been incorporated with $100,000 capital to operate steamships, by S. C. Wood, H. C. Hand and W. M. Stevens. Crowell & Rouse, 24 Broad street, are attorneys.

Tampa Shipbuilding & Engineering Co., Tampa, Fla., Ernest Kreher, president, Estuary street, is building first unit of shipbuilding plant on Nineteenth street, on site 320x400 feet, including machine shops, structural steel plant foundry and warehouse. Present plant will be removed to new site.

Alderton Engineering Corp., Brooklyn, N. Y., has been incorporated with $150,000 capital to operate a shipbuilding business by L. H. Ricj and E. A. Wililams. J. A. Davidson, 44 Court street, is attorney.

Mystic Steamship Corp., New York, has been incorporated with 2000 shares no par value by H. C. Hand, R. J. Gorman and S. C. Wood. J. R. VanHorne, 67 Wall street, is attorney.

Brooklyn-New Jersey Ferries, New York, has been incorporated with 1000 shares no par value by F. X. Clarke, R. G. Narelle and R. Hart. F. J. MacIntyre, 32 Broadway, is attorney.

Tug Flannery Boys and eight other corporations with capital from $10,000 to $45,000 each have been incorporated in New York by G. Billo, F. H. Butehorn and F. C. Taylor. W. F. Purdy, 25 Beaver street, is attorney.

Steamer Kishacoquillas Corp. has been incorporated at New York with $100,000 capital by H. C. Hand, S. C. Wood and W. M. Stevens. Crowell & Rouse, 24 Broad street, are attorneys.

International Refractory Engineering Corp. has been incorporated at New York with $10,000 capital to conduct a ship repairing business by F. E. Sayles and P. Tonnesen. A. E. Amsler, Richmond Hill, N. Y., is attorney.

General Stevedoring & Terminal Co., New York, has been incorporated with 1000 shares no par value by E. J. Keane and J. M. Seneca, 64 Wall street.

Long Island Shipyard, Port Jefferson, N. Y., has been incorporated with $45,000 capital by G. M. Tooker and V. N. Edwards. V. G. Tooker, Bridgeport, Conn., is attorney.

Mill River Boat Works, Hempstead, N. Y., has been incorporated with 100 shares no par value by E. Sprague, B. H. Myers and N. Nott. Wallace & Patterson, Rockville Center, N. Y., are attorneys.

Lang Steamship Agency, New York, has been incorporated with $10,000 capital and 1000 shares no par value by A. F. Oslefest, A. Donald and A. Lang. Greenbaum, Wolf & Ernst, 285 Madison avenue, are attorneys.

Oregon Steamship Corp., New York, has been incorporated with 2000 shares no par value by H. C. Hand and S. C. Wood.